

3.3.7 Southern Forest Group

Wisconsin's southern forest communities occur south and west of the climatic Tension Zone - the approximate area where vegetative communities change from the prairie, savanna, oak, and mixed hardwood forests of the south to the mixed deciduous-coniferous forests of the north (Figure 2-2). The landscape in northern Wisconsin was largely forested prior to Euro-American settlement, but the southern forests were interspersed with extensive prairie and savanna communities.

Information in Section 3.3.7 is taken from the WDNR Handbook "Ecological Landscapes of Wisconsin", and "Wisconsin's Biodiversity as a Management Issue" (Addis et al. 1995).

Although a number of species range across both the northern and southern forests, there are floristic elements specific to each region (e.g., boreal elements in the north and prairie elements in the south). Also, species abundance may differ, and they may occur in different assemblages. Historically, southern Wisconsin's communities included, in order of relative abundance, broad-leaved deciduous forest, oak savanna, conifer forest, prairie, and open wetlands.

Southern Wisconsin's landscapes have changed greatly during the past 150 years. The loss of forest has been widespread in areas suitable for agriculture and residential development. Another major change occurred as the open landscapes of prairie and savanna succeeded to closed canopy forest following the exclusion of periodic fires. In many areas, canopy composition is now shifting from oak dominance to shade-tolerant mesic hardwoods, primarily due to the absence of fire disturbances. Land use and ownership patterns have resulted in significant forest fragmentation throughout southern Wisconsin, highlighting the ecological significance of the few remaining large forested blocks, particularly those along major river corridors.

Data from the Forest Inventory and Analysis Program (FIA) indicate that as of 1996 there were approximately 4.8 million acres, or 31%, of southern Wisconsin classified as timberland. Oak-hickory was the most common forest type group, followed by the maple-basswood group, lowland hardwoods, pines, aspen-birch, and lowland conifers.

During the development of the Wisconsin Strategy for Wildlife Species of Greatest Conservation Need, the Southern Forest Group included the following ten community types:

- Central Sands Pine - Oak Forest (Section 3.3.7.1, Page 3-663)
- Floodplain Forest (Section 3.3.7.2, Page 3-670)
- Hemlock Relict (Section 3.3.7.3, Page 3-679)
- Pine Relict (Section 3.3.7.4, Page 3-684)
- Southern Dry Forest (Section 3.3.7.5, Page 3-690)
- Southern Dry-Mesic Forest (Section 3.3.7.6, Page 3-698)
- Southern Hardwood Swamp (Section 3.3.7.7, Page 3-707)
- Southern Mesic Forest (Section 3.3.7.8, Page 3-714)
- Southern Tamarack Swamp (Section 3.3.7.9, Page 3-721)
- White Pine - Red Maple Swamp (Section 3.3.7.10, Page 3-726)

Summary of Vertebrate Species of Greatest Conservation Need Associated with Southern Forest Communities

29 Birds
14 Herptiles
11 Mammals

54 Total Species

The vertebrate Species of Greatest Conservation Need in each of these ten southern forest communities are presented in the following sections, along with information on opportunities, threats, and priority conservation actions.

3.3.7.1 Central Sands Pine – Oak Forest

3.3.7.1.1 Community Overview

This forest community is associated with, but not limited to, the Central Sands ecoregion. Moisture conditions vary from dry to borderline dry-mesic. Soils are coarse-textured, acid sands, on landforms that can include glacial outwash, lakeplain, old dunes, and eroded sandstone-cored ridges. The canopy co-dominants vary, but in older, relatively undisturbed stands they may include white and red pines, various oaks, and sometimes red maple, black cherry and bigtooth aspen. The depauperate understory of the drier sites is composed of a small number of vascular plants that usually include huckleberry, early blueberry, bracken fern, wood anemone, and Pennsylvania sedge. Jack pine is sometimes co-dominant on the driest sites (jack pine - black/Hill's oak-dominated stands may be split out in the future).

3.3.7.1.2 Vertebrate Species of Greatest Conservation Need Associated with Central Sands Pine – Oak Forest

Eleven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with Central Sands pine – oak forest (Table 3-142).

Table 3-142. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with Central Sands pine – oak forest communities.

<i>Species Significantly Associated with Central Sands Pine – Oak Forest</i>
Birds
Whip-poor-will
Herptiles
Ornate Box Turtle
Mammals
Gray Wolf
<i>Species Moderately Associated with Central Sands Pine – Oak Forest</i>
Birds
Red-headed Woodpecker
Herptiles
Prairie Ringneck Snake
Bullsnake
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Woodland Vole

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-142 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both Central Sands pine – oak forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for

protection, restoration, and/or management of Central Sands pine – oak forest in each of the Ecological Landscapes (Tables 3-143 and 3-144).

- Using the analysis described above, a species was further selected if it had both a significant association with Central Sands pine – oak forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of Central Sands pine – oak forest. These species are shown in Figure 3-33.

Table 3-143. Vertebrate Species of Greatest Conservation Need that are (or historically were) significantly associated with Central Sands pine– oak forest communities and their association with Ecological Landscapes that support Central Sands pine – oak forest.

Central Sands Pine - Oak Forest		Birds (1)*	Herpetiles (1)	Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type		Whip-poor-will	Ornate Box Turtle	Gray Wolf
MAJOR				
Central Sand Hills				
Central Sand Plains				

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-144. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with Central Sands pine – oak forest communities and their association with Ecological Landscapes that support Central Sands pine – oak forest.

Central Sands Pine - Oak Forest		Birds (1)*	Herptiles (2)	Mammals (5)					
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type		Red-headed Woodpecker	Prairie Ringneck Snake	Bullsnake	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Woodland Vole
MAJOR									
Central Sand Hills									
Central Sand Plains									

Color Key

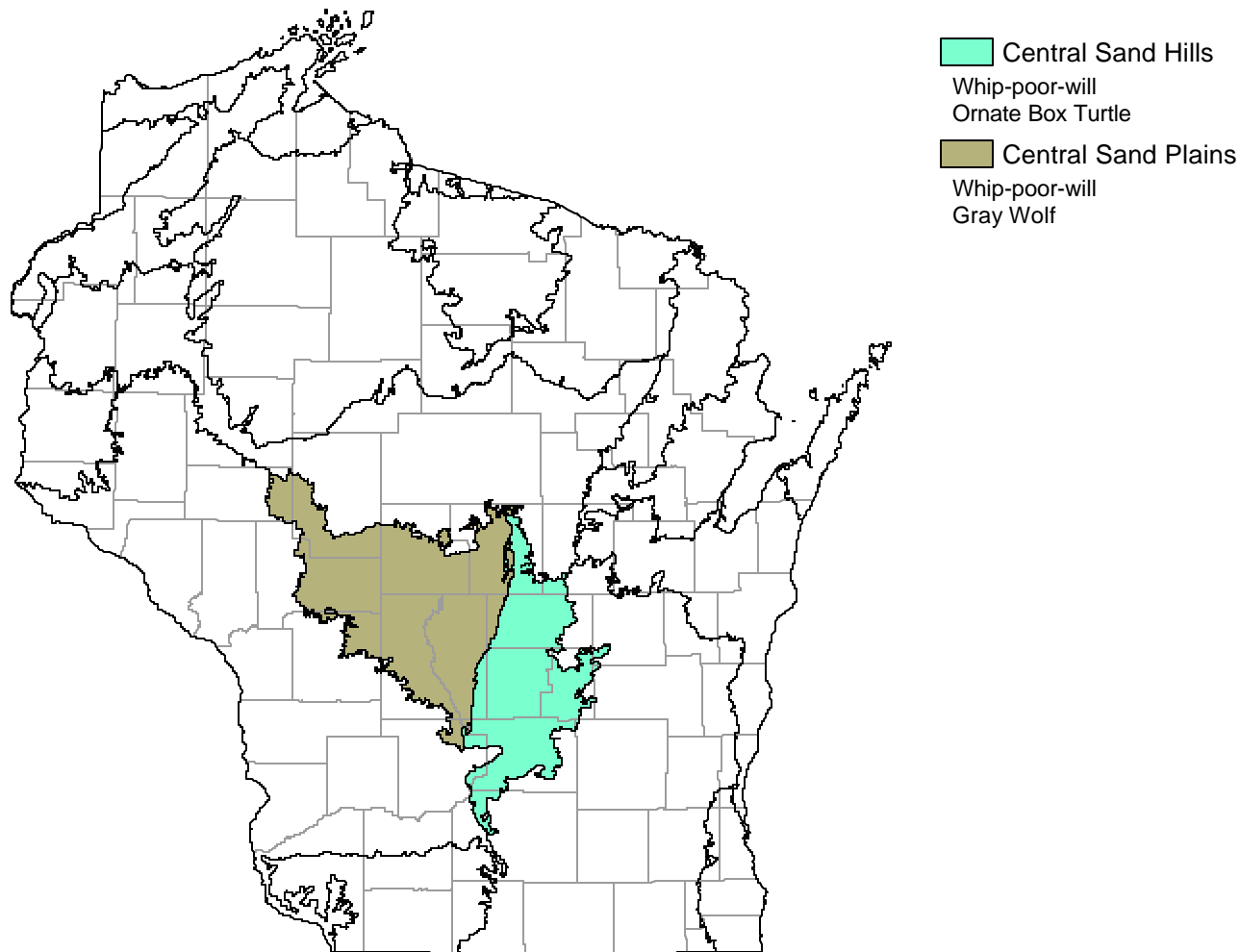
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-33. Vertebrate Species of Greatest Conservation Need that have both a significant association with Central Sands pine– oak forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of Central Sands pine– oak forest.



3.3.7.1.3 Threats and Priority Conservation Actions for Central Sands Pine – Oak Forest

3.3.7.1.3.1 Statewide Overview of Treats and Priority Conservation Actions for Central Sands Pine – Oak Forest

The following list of threats and priority conservation actions were identified for the Central Sands pine-oak forest in Wisconsin. The threats and priority conservation actions described below apply to all Ecological landscapes in Section 3.3.7.1.3.2 unless otherwise indicated.

Threats and Issues

- Large patches and older forests are underrepresented as compared with the numerous smaller and relatively young forest patches.
- Absence of fire makes it difficult to maintain and regenerate species that are adapted to periodic fire disturbance.
- Fragmentation is an issue, due to developments such as roads and residence construction, and the scale, pattern, and type of harvest that is generally practiced for this type.
- Unsustainable forest practices, such as harvest during improper seasons or on steep erodible slopes, can result in the release of sediments to nearby aquatic systems and wetlands.
- Invasive plants, such as garlic mustard, common buckthorn, and Tatarian honeysuckle are serious problems in some of the southernmost lands, and little provision is being made to prevent their spread or control them farther north.
- Some of the oaks that are important in this type are vulnerable to potential damage from gypsy moth infestations.
- Stand and ecosystem level simplification is taking place, especially where monocultures of planted pines are replacing stands dominated by oaks of low commercial value, or species that are difficult to manage because of susceptibility to pests (e.g., jack pine and jack pine budworm, and now, black oak and gypsy moth).
- Jack pine forests are declining statewide due to lack of fire disturbance, difficulty in obtaining natural regeneration, and low economic value as compared with red pine.
- There is a tendency in some areas to emphasize and encourage growth of either the pines or the oaks - but usually not a mixture of both, and as a consequence the mixed forests are underrepresented.
- Structural features such as large trees, standing snags, coarse woody debris, windthrow gaps, and pit and mound microtopography are often reduced or absent from intensively managed stands.
- In this forest type, gaps can create refugia for understory plants and associated animals that require relatively high light levels (e.g., species with prairie or barrens affinities).
- Motorized recreation and high road densities can contribute to soil loss and sedimentation, and facilitate the spread of invasive plants.

Priority Conservation Actions

- Maintain large forest blocks of this type where they exist, and increase connectivity where feasible.
- Work toward a balanced mosaic of age-classes; older age classes are currently underrepresented.
- Mixed pine-oak forests contribute significantly to the character and diversity of the forest, and it is desirable to maintain or restore them to represent the range of variability expressed by the type, in a range of patch sizes and age classes.
- Use adaptive management techniques to restore and maintain structure and composition, and maintain the mixed character of many stands; monitor and share results.
- Encourage the use of prescribed fire to restore and maintain the variability of composition and structure in this community, and increase species diversity.
- Develop educational tools and demonstration areas that promote benefits of prescribed fire, and address liability concerns.
- Encourage retention and natural regeneration of oak species.

- Intensively managed industrial and county forests can fill a niche in providing early successional habitats in some Ecological Landscapes.
- Monitor and control invasive plants and invertebrates.
- Continue to support biological control research to develop more effective methods of controlling invasive organisms.
- Limit activities that facilitate the spread of invasive species, particularly into non-infested areas.
- Use Best Management Practices and other sustainable forest community management practices to prevent detrimental soil and water effects.
- Manage recreational uses so they are compatible with protecting the environment (e.g., limiting erosion, controlling spread of invasives, preventing damage to sensitive soils and vegetation).
- Refinement of the dry forest classification from the perspective of maintaining or restoring diversity is needed.

3.3.7.1.3.2 Additional Considerations for Central Sands Pine – Oak Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of the Central Sands pine – oak forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for northern wet forest found in Section 3.3.7.1.3.1.

Additional Considerations for Central Sands Pine – Oak Forest in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Central Sands Pine – Oak Forest

Central Sand Hills

Occurrences of this type are found at Emmons Creek State Fishery Area (Portage County), Hartman Creek State Park (Portage and Waupaca Counties), and Standing Rocks County Park (Portage County). Additional field inventory is desirable in parts of this Ecological Landscape.

Central Sand Plains

This Ecological Landscape is the best place to maintain large forest blocks for this type, and to implement the other conservation actions (e.g., encourage species and structural diversity, achieve balanced age-class distributions) because of the abundance of the type and the large public ownership. Fragmentation is a particular problem in some parts of this Ecological Landscape, due to residential development and road construction.

Areas near the Wisconsin River were the first of the historic “pineries” to be logged during the Cutover. White pine forests are now regenerating in the Central Sand Plains, but are still considerably younger and smaller than the original pineries. A proportion of these white pine forests could be allowed to age and develop structural characteristics approximating those of the historic forest, to allow study of their habitat value.

Important sites include the Overmeyer Hills complex, an extensive area of dry forest on sandstone ridges within the Black River State Forest (Jackson County), Quincy Bluff and Wetlands State Natural Area (Adams County), Mirror Lake State Park (Sauk County), and Dells of the Wisconsin River State Natural Area (Columbia County). Efforts should be made to maintain or enhance connectivity among large forested areas, including state, county and industrial forests.

Additional Considerations for Central Sands Pine – Oak Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Central Sands Pine – Oak Forest

No Ecological Landscapes with important opportunities were identified. However, there are forests in the Northwest Sands, Northeast Sands, and Western Coulees and Ridges Ecological Landscapes that resemble those described from Central Wisconsin, but more sampling and data analysis are necessary to clarify community level relationships.

3.3.7.2 Floodplain Forest

3.3.7.2.1 Community Overview

This lowland hardwood forest community type occurs along large rivers, usually of Stream Order 3 or higher. Most of these rivers originate in northern Wisconsin and flow southward, growing in size as the volume of water they carry increases. As the stream gradients diminish, the floodplains become broader. Periodic floods, particularly in the spring, are the key natural disturbance event to which species of this community are adapted. Silt deposition and development of microtopography during flood events creates suitable sites for tree germination and establishment, and floods also carry seeds and propagules of plant species. The most extensive occurrences of floodplain forest are found along the large rivers of southern Wisconsin, but the community also occurs at scattered locations in the north. The type was uncommon historically, occupying only about 3% of the Western Coulees and Ridges Ecological Landscape and even smaller percentages of other Ecological Landscapes (Finley 1976). Canopy dominants vary, but may include silver maple, river birch, green and black ashes, hackberry, swamp white oak, and eastern cottonwood. Black willow, basswood, red oak, and red maple are associated tree species found in these forests. Historically, the elms were highly significant components of the floodplain forests, but Dutch elm disease has eliminated most large elm trees that formerly provided supercanopy structure, snag and den sites, and large woody debris. Northern occurrences of this type tend to be less extensive, are often discontinuous, and are relatively species-poor compared to those in the south. Silver maple and green ash remain among the dominant species, with balsam-poplar, bur oak, and box elder replacing some of the many missing southern trees.

Understory composition is also quite variable, and follows the pattern exhibited by the canopy species, with the most extensive stands and highest plant species diversity occurring in southwestern Wisconsin. Buttonbush is a locally dominant shrub that may form dense thickets on the margins of oxbow lakes, sloughs and ponds, which are often important aquatic habitats within these forests. Wood nettle, stinging nettle, sedges (e.g., *Carex grayii*, *C. lupulina*, *C. hystericina*, *C. tuckermanii*), native grasses (e.g., *Cinna arundinacea*, *Elymus villosus*, *Leersia virginica*), ostrich fern and green-headed coneflower are important understory herbs, and lianas such as Virginia creepers, grapes, Canada moonseed, and poison-ivy are often common. Among the more striking herbs of this community are cardinal flower, fringed loosestrife, and green dragon.

The sprawling floodplains found along the largest rivers sometimes consist of several terraces capable of supporting forests. These are subject to floods with differing frequencies and levels of inundation, and support patches of varying floristic composition depending upon local elevation differences, edaphic factors, and disturbance history. The lower terraces experience the most frequent, severe, and long-lasting floods; the uppermost terraces flood infrequently, and the rich alluvial soils can support mesophytic trees species and rich groundlayers similar to those of the mesic hardwood forests.

3.3.7.2.2 Vertebrate Species of Greatest Conservation Need for Floodplain Forest

Thirty-five vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with floodplain forest (Table 3-145).

Table 3-145. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with floodplain forest communities.

<i>Species Significantly Associated with Floodplain Forest</i>
Birds
Yellow-Crowned Night-heron
Red-shouldered Hawk
Solitary Sandpiper
Yellow-billed Cuckoo
Yellow-throated Warbler
Cerulean Warbler
Prothonotary Warbler
Kentucky Warbler
Rusty Blackbird
Herptiles
Four-toed Salamander
Wood Turtle
Eastern Massasauga Rattlesnake
<i>Species Moderately Associated with Floodplain Forest</i>
Birds
Great Egret
Blue-winged Teal
Black-billed Cuckoo
Red-headed Woodpecker
Acadian Flycatcher
Least Flycatcher
Veery
Wood Thrush
Blue-winged Warbler
Herptiles
Pickerel Frog
Blanding's Turtle
Black Rat Snake
Butler's Garter Snake
Timber Rattlesnake
Mammals
Water Shrew
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Northern Flying Squirrel
Woodland Jumping Mouse
Gray Wolf
Moose

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-145 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both floodplain forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of floodplain forest in each of the Ecological Landscapes (Tables 3-146 and 3-147).
- Using the analysis described above, a species was further selected if it had both a significant association with floodplain forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of floodplain forest. These species are shown in Figure 3-34.

Table 3-146. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with floodplain forest communities and their association with Ecological Landscapes that support floodplain forest.

Floodplain Forest	Birds (9)*									Herpetiles (3)		
	Yellow-crowned Night-Heron	Red-shouldered Hawk	Solitary Sandpiper	Yellow-billed Cuckoo	Yellow-throated Warbler	Cerulean Warbler	Prothonotary Warbler	Kentucky Warbler	Rusty Blackbird	Four-toed Salamander	Wood Turtle	Eastern Massasauga Rattlesnake
MAJOR												
Central Sand Plains												
Southeast Glacial Plains												
Western Coulee and Ridges												
IMPORTANT												
Central Lake Michigan Coastal												
Central Sand Hills												
Forest Transition												
North Central Forest												
Northern Lake Michigan Coastal												
Superior Coastal Plain												
Western Prairie												
PRESENT (MINOR)												
Northeast Sands												
Northern Highland												
Northwest Sands												
Southern Lake Michigan Coastal												
Southwest Savanna												

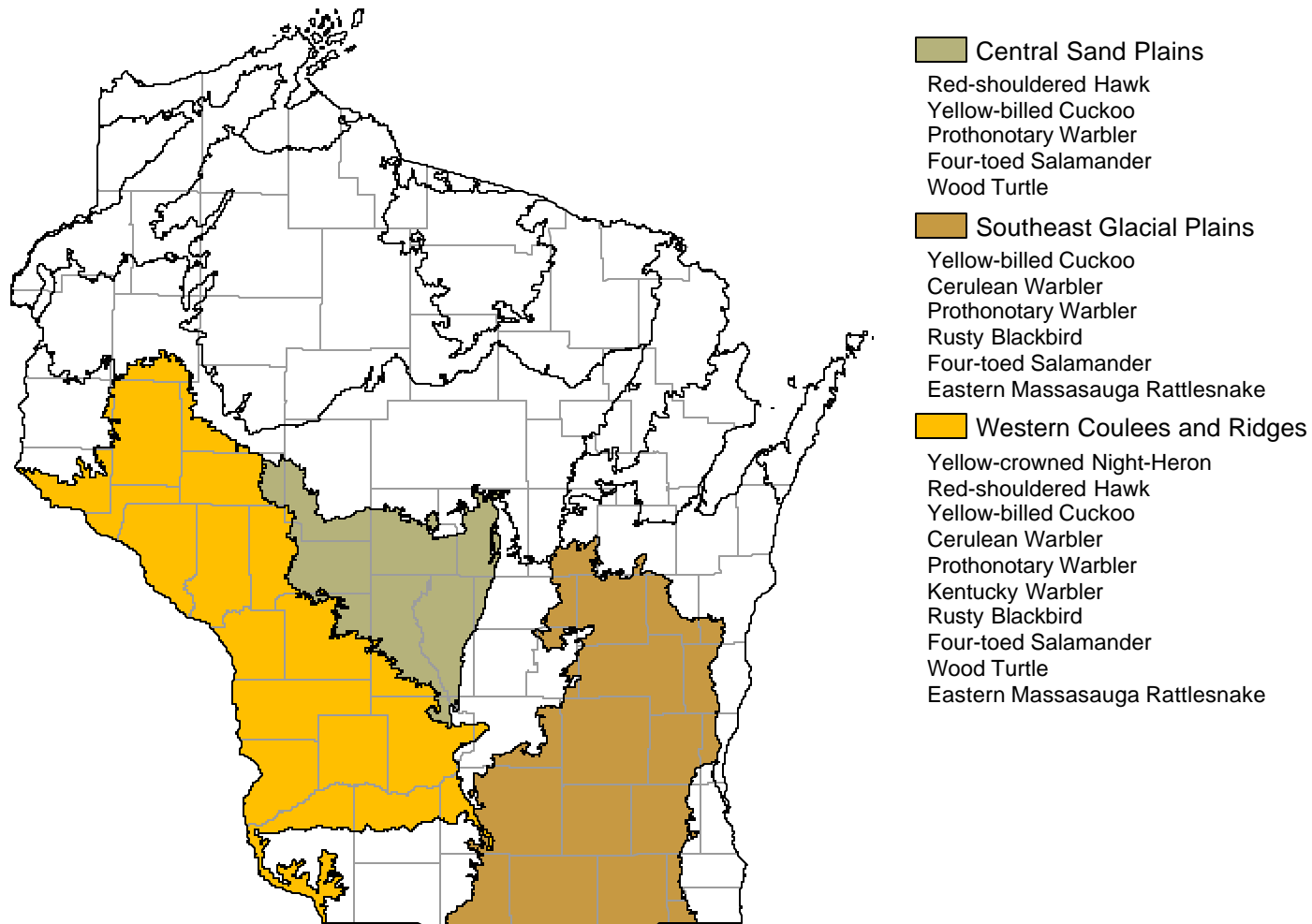
* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-147. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with floodplain forest communities and their association with Ecological Landscapes that support floodplain forest.

Floodplain Forest	Birds (9)*									Herptiles (5)					Mammals (9)								
	Great Egret	Blue-winged Teal	Black-billed Cuckoo	Red-headed Woodpecker	Acadian Flycatcher	Least Flycatcher	Veery	Wood Thrush	Blue-winged Warbler	Pickered Frog	Blanding's Turtle	Black Rat Snake	Butler's Garter Snake	Timber Rattlesnake	Water Shrew	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Northern Flying Squirrel	Woodland Jumping Mouse	Gray Wolf	Moose
MAJOR																							
Central Sand Plains																							
Southeast Glacial Plains																							
Western Coulee and Ridges																							
IMPORTANT																							
Central Lake Michigan Coastal																							
Central Sand Hills																							
Forest Transition																							
North Central Forest																							
Northern Lake Michigan Coastal																							
Superior Coastal Plain																							
Western Prairie																							
PRESENT (MINOR)																							
Northeast Sands																							
Northern Highland																							
Northwest Sands																							
Southern Lake Michigan Coastal																							
Southwest Savanna																							

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-34. Vertebrate Species of Greatest Conservation Need that have both a significant association with floodplain forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of floodplain forest.



3.3.7.2.3. Threats and Priority Conservation Actions for Floodplain Forest

3.3.7.2.3.1 Statewide Overview of Threats and Priority Conservation Actions for Floodplain Forest

The following list of threats and priority conservation actions were identified for floodplain forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.2.3.2 unless otherwise indicated.

Threats and Issues

- Hydrologic alterations of many of our major rivers due to dam and impoundment construction have changed the frequency, timing, magnitude, and duration of flood events, casting uncertainty on long-term response of the floodplain vegetation.
- Land use planning that is not comprehensive and does not emphasize conservation considerations can lead to development in locations that limit options for this community. Development in the higher portions of floodplains, or on bluff tops overlooking floodplains, can impact these forests directly, or through indirect effects of human activity (e.g. spreading invasive species, using fertilizers, increasing runoff).
- Agricultural land uses adjacent to floodplains can result in sedimentation, pollution, and erosion.
- Grazing can damage understory vegetation, including the regenerating trees.
- Conversion to other community types is occurring; e.g., dike construction can result in conversion to marsh or wet shrub communities. This has been a locally common practice in some areas to increase habitat for waterfowl.
- Among invasive species, reed canary grass has become a major problem. It rapidly increases in abundance and takes over this community type after major disturbance events such as heavy timber harvest or windthrow.
- Moneywort and creeping Charlie are now established and sometimes common in floodplain systems. Phragmites also has the potential to become established in these systems.
- Loss of overstory American elm due to Dutch elm disease has affected stand structure, as the elms were often abundant, had the potential to reach great size, and had distinctive limb architecture (such as could be observed along many city streets prior to the ravages of Dutch elm disease). In some areas the deaths of the large elms has left canopy gaps that have not yet filled with trees.
- An exotic insect, the Emerald Ash Borer, may threaten the ash component of this type, and the gypsy moth is a potential threat to oaks and perhaps other species.
- Unsustainable forest management practices can alter composition, result in the loss of forest habitat, and facilitate the spread of invasive species such as reed canary grass.
- Forest harvesting within large forest blocks can cause habitat fragmentation that reduces the value of the forest block for some interior specialists.
- More information is needed to understand how to manage this type, control or reverse the incursions of invasive species, and retain, restore, or mimic functional processes that have been lost or impaired.

Priority Conservation Actions

- Maintain and connect large blocks of habitat where feasible.
- Along with protection of the floodplain corridors, ecological gradients from lowlands to the uplands should also be protected. This will enlarge the amount of habitat available, allow for the movement of species upslope or downslope as environmental conditions change over time, and provide suitable habitat for those species that require large areas, or are dependent upon a mosaic of interconnected habitats for their long-term survival.
- Use buffers to protect floodplain systems from sedimentation and pollutants.

- Continued monitoring and additional research are needed to better document and understand the composition, structure, and function of floodplain systems.
- Research and further development of silvicultural systems is needed to sustainably manage and regenerate floodplain forests despite the presence of invasive species and high levels of deer herbivory.
- Continue and support research to find effective biocontrols for invasive species.
- Use management practices that do not lead to the spread of reed canary grass and other invasive species.
- The extensive floodplain forests, together with their associated large river systems, are major repositories of native diversity. To date, they have not been the subject of a large-scale planning effort that integrates ecological and conservation objectives with recreation and commodity production. Additional protection of floodplain and river systems is needed, taking into account their statewide and continental significance.

3.3.7.2.3.2 Additional Considerations for Floodplain Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of floodplain forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for floodplain forest found in Section 3.3.7.2.3.1.

Additional Considerations for Floodplain Forest in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Floodplain Forest

Central Sand Plains

The development of forested lowland habitat for cranberry farming has affected the Floodplain Forests of the Yellow River and its tributaries. Gravel mining occurs in some parts of the floodplain of the Black River.

There are good examples of this community type on the Black, Yellow, Lemonweir, and Wisconsin Rivers. There are areas of public ownership on the Black River State Forest, at the confluence of the Yellow and Wisconsin Rivers at Buckhorn State Park, and on the Lower Lemonweir River.

Southeast Glacial Plains

Significant opportunities for management and protection occur on the Milwaukee, lower Wolf, and Sugar Rivers, and to a lesser extent, on the Rock River at Lake Koshkonong. Public ownership is scattered and patchy.

Western Coulees and Ridges

This Ecological Landscape offers the best opportunities to manage for this community type. Large, relatively continuous areas of floodplain forest occur along the Mississippi, and the lower stretches of the Wisconsin, Chippewa, and Black Rivers. Smaller rivers are also associated with significant stands of this type, including the Red Cedar, Yellow, Hay, and Lemonweir. All of these sites are important to floodplain specialists (e.g., the prothonotary warbler) as well as many forest interior species. Public ownership is extensive at some locations, e.g., the Mississippi River (USFWS, USACOE, WDNR), the Lower Wisconsin River (WDNR), the Lower Chippewa River (WDNR), and the Lower Black River (WDNR).

Additional Considerations for Floodplain Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Floodplain Forest

Central Lake Michigan Coastal

A significant part of the Lower Wolf River corridor is within this Ecological Landscape and merits strong protection. Public ownership is scattered here, and isolated rather than connected.

Central Sand Hills

Protection and management opportunities occur along the Wisconsin, Lower Baraboo, and Montello Rivers.

Forest Transition

Opportunities for management are limited here but include significant sites along the Lower St. Croix River, and some parts of the middle stretches of the Wisconsin River and its tributaries.

North Central Forest

This type is at the northern edge of its range in this Ecological Landscape. Opportunities are limited but there are several important occurrences and large blocks of public ownership. Existing large blocks and connectivity should be maintained where possible (e.g., along the Wisconsin, Chippewa, Jump, Yellow, and Black rivers), and managed as part of a mosaic of other forest communities.

Northern Lake Michigan Coastal

Opportunities are limited but there are several important occurrences. This community type should be maintained where it exists along the Lower Wolf and Peshtigo Rivers. Large occurrences of a similar community, hardwood swamp, exist in the Ecological Landscape near the west shore of Green Bay.

Superior Coastal Plain

Floodplain forest is at its northern range extremity here. In this Ecological Landscape the type is uncommon, and generally supports fewer species than more southerly occurrences. Floodplain corridors around the best occurrences (e.g., those on the Nemadji, Bad, and White Rivers) should be protected and maintained. Protection of high quality examples of this type would contribute significantly to the maintenance of regional diversity, as many plants have been documented on the floodplain terraces of the Superior Coastal Plain that occur in no other habitat this far north. Invasive plants are present but do not appear to be a large problem at this time. A long-term monitoring program is needed.

Western Prairie

The most significant sites containing this type are on the Lower St. Croix River in Polk and St. Croix Rivers. The protection level is relatively high, as this area is within the St. Croix-Namekagon National Scenic Riverway administered by the National Park Service, but recreational use of this area is very high and impacts should be monitored. Residential development on the bluffs above the floodplain has increased rapidly in recent years, and the conservation implications include the inadvertent introduction of invasive species, loss or disturbance of the forested bluffs adjoining the floodplain, and generally higher levels of human use.

3.3.7.3 Hemlock Relict

3.3.7.3.1 Community Overview

Hemlock relicts are small patches of mesic forest composed mostly of species that are disjunct from and generally far south of their usual Wisconsin ranges. Most documented relicts occur in southwestern Wisconsin's Driftless Area, within the Western Coulees and Ridges Ecological Landscape. Typical sites are deep, steep-sided, moist ravines, with cool northern or eastern slope exposures. Exposures of bedrock, most often Cambrian sandstones, are typically present, and contribute to the ability of this community to develop and persist in areas that would otherwise be vegetated with deciduous hardwood forests. The porous sandstone has a high capacity to hold water, which slowly moves through the rock and keeps conditions humid and cool. The dominant tree is most frequently eastern hemlock. Eastern white pine, yellow birch, and paper birch are common "northern" canopy associates. Other trees present are usually those that are present in the adjoining hardwood forests. Shrubs and herbs with northern affinities are important, and may include mountain maple, Canada yew, showy mountain ash, blue-bead lily, rosy twisted-stalk, shining club-moss, and spinulose wood fern. The dense shade of the hemlock, combined with the northern aspect of many stands, means that very little light reaches the forest floor. The groundlayer is often very sparse.

Hemlock relicts are highly localized, and not randomly or widely distributed in southwestern Wisconsin. They are concentrated in a few areas, such as the drainages of the upper Kickapoo and Baraboo Rivers, and in a few of the deep gorges that cut into the flanks of the Baraboo Hills. Extremely isolated outliers are known from a few sites south of the Wisconsin River. Unusual plants and animals have been documented in a number of stands. These include "periglacial" relicts, that for various reasons were unable to keep pace with changes to the vegetation as the climate changed following the last glacial advance, and a number of habitat specialists that are rare elsewhere in southern Wisconsin.

3.3.7.3.2 Vertebrate Species of Greatest Conservation Need Associated with Hemlock Relict

Seven vertebrate Species of Greatest Conservation Need were identified as moderately associated with hemlock relicts (Table 3-148). There were not any vertebrate Species of Greatest Conservation Need that were identified as significantly associated with hemlock relict communities.

Table 3-148. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately associated with hemlock relict communities.

Birds

Veery

Canada Warbler

Mammals

Northern Long-eared Bat

Silver-haired Bat

Eastern Red Bat

Hoary Bat

Northern Flying Squirrel


In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-148 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both hemlock relict and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:


- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of hemlock relict in each of the Ecological Landscapes (Table 3-149).


Table 3-149. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with hemlock relict communities and their association with Ecological Landscapes that support hemlock relicts.

Hemlock Relict	Birds (2)*		Mammals (5)				
	Veery	Canada Warbler	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Northern Flying Squirrel
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type							
MAJOR							
Western Coulee and Ridges							
PRESENT (MINOR)							
Central Sand Plains							
Southwest Savanna							

Color Key

 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape

 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

3.3.7.3.3 Threats and Priority Conservation Actions for Hemlock Relict

3.3.7.3.3.1 Statewide Overview of Threats and Priority Conservation Actions for Hemlock Relict

The following list of threats and priority conservation actions were identified for hemlock relict in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.3.3.2 unless otherwise indicated.

Threats and Issues

- Disruption to the factors that are responsible for maintaining the special microclimatic conditions (hydrology, deep shade) of the relicts can cause the loss of northern species near their southern range limits, as well as some of the habitat specialists.
- The isolation of most of the relict stands can be problematic, as species lost from a given site may not be capable of recolonizing that site. The removal of forest cover from lands around and between the relicts can exacerbate this situation, and also render sites unsuitable for species with relatively large area requirements, or that are vulnerable to edge effects.
- Grazing, logging, and invasive herbs such as garlic mustard are also threats to the integrity of these unusual communities.
- Heavy recreational use by horses, mountain bikes, and even hikers can lead to rapid erosion of the steep slopes and fragile, sometimes springy, and sparsely vegetated soils characteristic of this community.
- Hemlock is reproducing surprisingly well in some of these southern stands, but evidence of excessive browse pressure from white-tailed deer is obvious at other sites.

Priority Conservation Actions

- High levels of protection are warranted for sites that are known to support intact communities and rare species populations. Use a variety of means, including acquisitions, easements, and designations, to protect known sites of high ecological value.
- On public lands, avoid routing recreational trails through hemlock relicts when possible. When that can't be avoided, monitor carefully for evidence of erosion, browse damage, and infestation by invasive plants.
- Encourage protection of significant sites on private lands by developing appropriate incentive programs.
- Additional survey work for selected taxa is warranted for this type, especially for some of the groups that are less well known, such as lichens, mosses, ferns, and invertebrates.

3.3.7.3.3.2 Additional Considerations for Hemlock Relict by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of hemlock relict exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for hemlock relict found in Section 3.3.7.3.3.1.

Additional Considerations for Hemlock Relict in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Hemlock Relict

Western Coulees and Ridges

This community may be seen at Mt. Pisgah Hemlock-Hardwoods State Natural Area in Wildcat Mountain State Park (Vernon County), within the Kickapoo Reserve (Bridge 8 Woods and Cliffs State Natural Area, Vernon County), and at Hemlock Draw (Sauk County).

Additional Considerations for Hemlock Relict in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Hemlock Relict

Central Sand Plains

This community occurs locally at the extreme southern edge of this Ecological Landscape, for example Blackhawk Island in the Dells of the Wisconsin River (Juneau County), and Witches Gulch (Adams County).

3.3.7.4 Pine Relict

3.3.7.4.1 Community Overview

“Pine relicts” are pine-dominated conifer forests that occur as discrete, isolated stands in the Driftless Area of southwestern Wisconsin. Most of these dry “relicts” are associated with sandstone or dolomite bluffs. The bedrock may outcrop as cliffs or ledges, or underlie a thin layer of soil. The vegetation surrounding the conifer-clad bluffs is more typical of southern Wisconsin, including hardwood forests, remnant prairies and savannas, and lands used for various agricultural purposes. The dominant trees of the “relicts” may be eastern white pine, red pine or, less commonly, jack pine. The pines sometimes occur in almost pure stands, but are often mixed with hardwoods. The groundlayer is sometimes strongly reminiscent of those found in the pine forests of northern Wisconsin, in the heart of our northern pineries. Representative understory plants include ericaceous shrubs such as blueberries (*Vaccinium angustifolium*, and *V. myrtilloides*) and huckleberry, and herbs or sub-shrubs such as wintergreen, pipsissewa, partridge-berry, and moccasin flower. These species of generally northern distributions are often mixed with familiar herbs of the southern Wisconsin’s oak forests, savannas, and prairies.

Historically, the pine relicts were probably maintained by a combination of xeric site conditions and periodic wildfire.

3.3.7.4.2 Vertebrate Species of Greatest Conservation Need Associated with Pine Relict

Ten vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with pine relict (Table 3-150).

Table 3-150. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with pine relict communities.

<i>Species Significantly Associated with Pine Relict</i>
Herptiles
Black Rat Snake
Timber Rattlesnake
<i>Species Moderately Associated with Pine Relict</i>
Birds
Whip-poor-will
Veery
Canada Warbler
Red Crossbill
Herptiles
Bullsnake
Mammals
Eastern Red Bat
Hoary Bat
Northern Flying Squirrel




In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-150 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both pine relict and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of pine relict in each of the Ecological Landscapes (Tables 3-151 and 3-152).
- Using the analysis described above, a species was further selected if it had both a significant association with pine relict and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of pine relict. These species are shown in Figure 3-35.

Table 3-151. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with pine relict communities and their association with Ecological Landscapes that support pine relict.

Pine Relict Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Herpetiles (2)*	
	Black Rat Snake	Timber Rattlesnake
MAJOR		
Western Coulee and Ridges		
IMPORTANT		
Southwest Savanna		

Color Key


-  = HIGH probability the species occurs in this Ecological Landscape
-  = MODERATE probability the species occurs in this Ecological Landscape
-  = LOW or NO probability the species occurs in this Ecological Landscape


* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.


Table 3-152. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with pine relict communities and their association with Ecological Landscapes that support pine relict.

Pine Relict	Birds (4)*				Herptiles (4)	Mammals (3)		
	Whip-poor-will	Veery	Canada Warbler	Red Crossbill	Bullsnake	Eastern Red Bat	Hoary Bat	Northern Flying Squirrel
MAJOR								
Western Coulee and Ridges								
IMPORTANT								
Southwest Savanna								
PRESENT (MINOR)								
Central Sand Plains								

Color Key

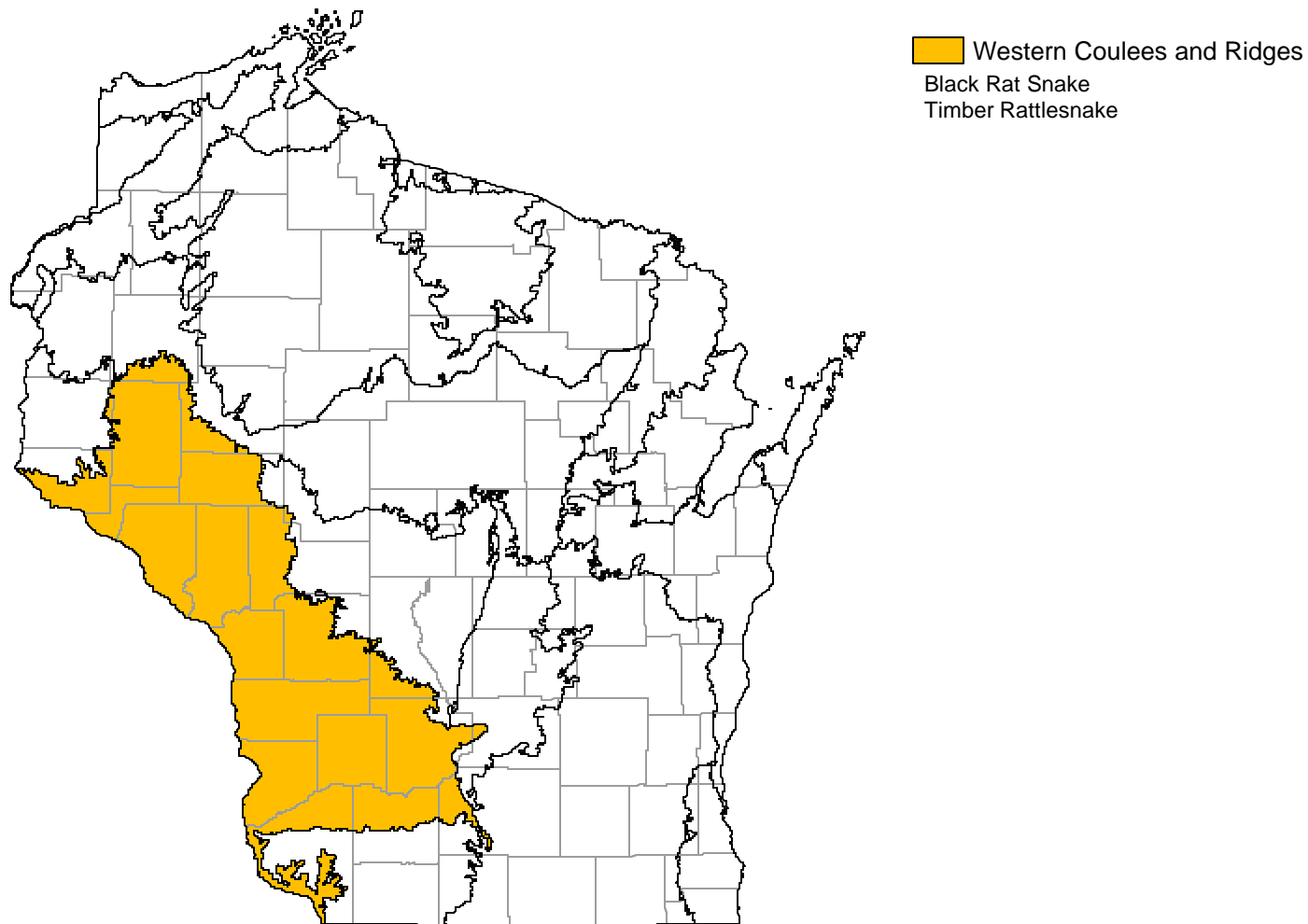
 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape

 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-35. Vertebrate Species of Greatest Conservation Need that have both a significant association with pine relict and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of pine relict.



3.3.7.4.3 Threats and Priority Conservation Actions for Pine Relict

3.3.7.4.3.1 Statewide Overview of Threats and Priority Conservation Actions for Pine Relict

The following list of threats and priority conservation actions were identified for pine relict communities in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.4.3.2 unless otherwise indicated.

Threats and Issues

- Timber harvest can alter and simplify stand structure, and increase the hardwood component.
- Heavy equipment can damage the steep, easily erodible slopes and thin soils on which this community often occurs.
- Grazing can damage soils and the forest groundlayer, including seedling and sapling conifers.
- The small size and isolation of most stands increases the probability of species loss.
- Invasive plants, such as common buckthorn, Tatarian honeysuckle, and multiflora rose can be problems.
- The recent trend of constructing residences on bluffs can lead to direct and indirect disturbance of this community, and limit management options such as the use of prescribed fire.

Priority Conservation Actions

- Manage within an appropriate mosaic of other communities, which can include dry cliff, dry prairie, oak opening, and various types of southern hardwood forest.
- Emphasize protection of the largest and least disturbed sites. Because most stands are small and isolated by physical factors, another important conservation consideration is to target clusters of relicts that are close to one another, and exhibit variable site conditions.
- More research is needed to develop appropriate fire prescriptions for this type.

3.3.7.4.3.2 Additional Considerations for Pine Relict by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of pine relict exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for pine relict found in Section 3.3.7.4.3.1.

Additional Considerations for Pine Relict in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Pine Relict

Western Coulee and Ridges

Examples occur at Pine Glen within Devils Lake State Park (Sauk County), Snow Bottoms State Natural Area (Grant County), Governor Dodge State Park (Iowa County), and Ridgeway Pines State Natural Area (Iowa County).

Additional Considerations for Pine Relict in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Pine Relict

Southwest Savanna

The known sites in this Ecological Landscape occur on private lands.

3.3.7.5 Southern Dry Forest

3.3.7.5.1 Community Overview

Oaks are the dominant species in this upland forest community of dry sites. White oak and black oak are dominant, often with admixtures of northern red and bur oaks and black cherry. In the well-developed shrub layer, brambles (*Rubus* spp.), gray dogwood, and American hazelnut are common. Frequent herbaceous species are wild geranium, false Solomon's-seal, hog-peanut, and rough-leaved sunflower. This community type intergrades to oak woodland, which has similar canopy composition but a more open forest floor due to relatively frequent ground fires and possibly also due to grazing by elk, bison, or deer prior to EuroAmerican settlement.

3.3.7.5.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Dry Forest

Seventeen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with southern dry forest (Table 3-153).

Table 3-153. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with southern dry forest communities.

<i>Species Significantly Associated with Southern Dry Forest</i>	
Birds	
Whip-poor-will	
Herptiles	
Ornate Box Turtle	
Black Rat Snake	
Timber Rattlesnake	
Mammals	
Woodland Vole	
<i>Species Moderately Associated with Southern Dry Forest</i>	
Birds	
Red-headed Woodpecker	
Wood Thrush	
Blue-winged Warbler	
Worm-eating Warbler	
Herptiles	
Northern Prairie Skink	
Western Worm Snake	
Yellow-bellied Racer	
Prairie Ringneck Snake	
Bullsnake	
Mammals	
Northern Long-Eared Bat	
Eastern Red Bat	
Gray Wolf	

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-153 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern




dry forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern dry forest in each of the Ecological Landscapes (Tables 3-154 and 3-155).
- Using the analysis described above, a species was further selected if it had both a significant association with southern dry forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern dry forest. These species are shown in Figure 3-36.

Table 3-154. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with southern dry forest communities and their association with Ecological Landscapes that support southern dry forest.

Southern Dry Forest Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (1)*	Herptiles (3)			Mammals (1)
	Whip-poor-will	Ornate Box Turtle	Black Rat Snake	Timber Rattlesnake	Woodland Vole
MAJOR					
Central Sand Hills					
Southeast Glacial Plains					
Western Coulee and Ridges					
IMPORTANT					
Central Sand Plains					
Southern Lake Michigan Coastal					
Southwest Savanna					
PRESENT (MINOR)					
Western Prairie					

Color Key

-  = HIGH probability the species occurs in this Ecological Landscape
-  = MODERATE probability the species occurs in this Ecological Landscape
-  = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-155. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern dry forest communities and their association with Ecological Landscapes that support southern dry forest.

Southern Dry Forest	Birds (4)*				Herptiles (5)					Mammals (3)		
	Red-headed Woodpecker	Wood Thrush	Blue-winged Warbler	Worm-eating Warbler	Northern Prairie Skink	Western Worm Snake	Yellow-bellied Racer	Prairie Ringneck Snake	Bullsnake	Northern Long-eared Bat	Eastern Red Bat	Gray Wolf
MAJOR												
Central Sand Hills												
Southeast Glacial Plains												
Western Coulee and Ridges												
IMPORTANT												
Central Sand Plains												
Southern Lake Michigan Coastal												
Southwest Savanna												
PRESENT (MINOR)												
Western Prairie												

Color Key

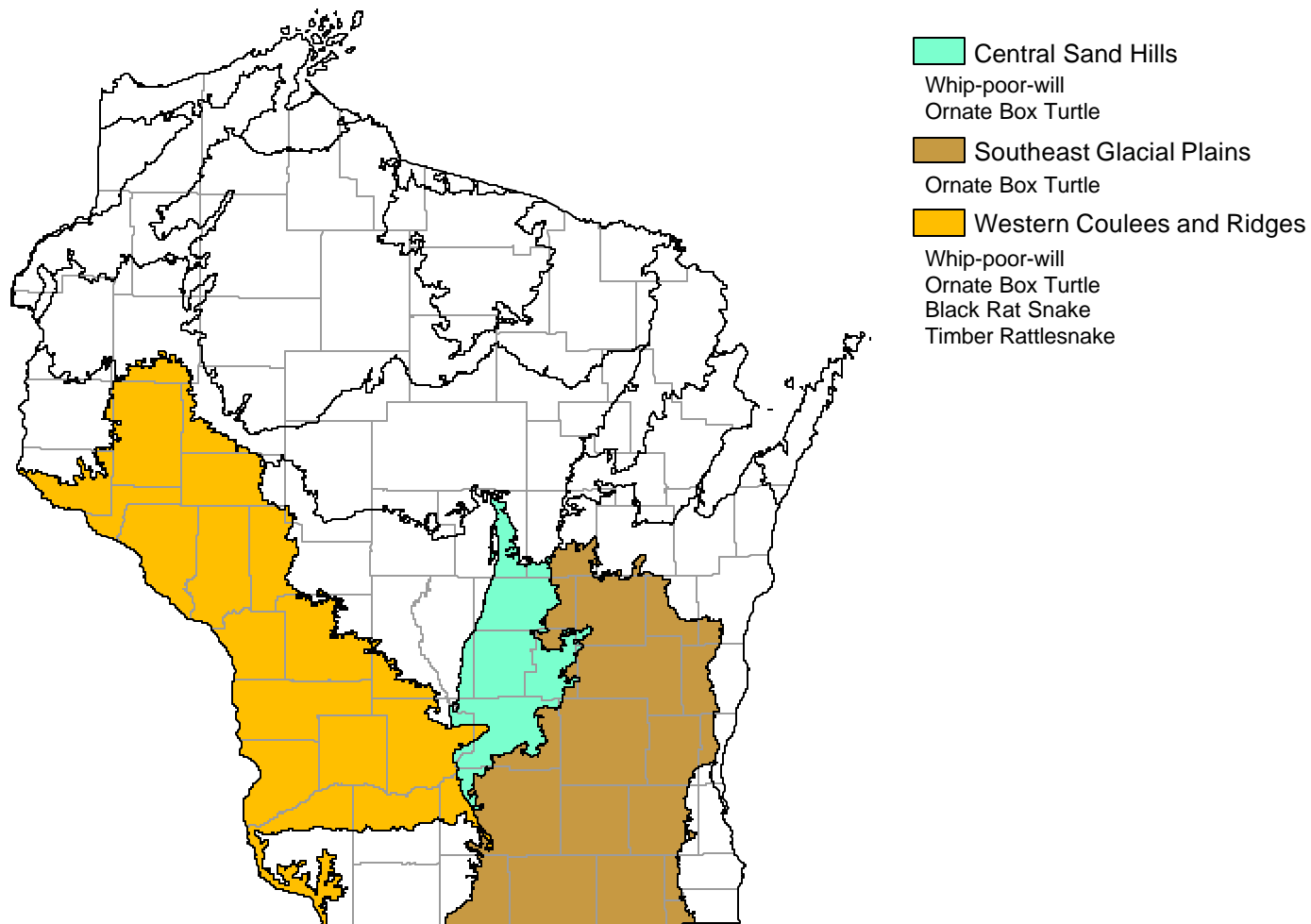
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-36. Vertebrate Species of Greatest Conservation Need that have both a significant association with southern dry forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern dry forest.



3.3.7.5.3 Threats and Priority Conservation Actions for Southern Dry Forest

3.3.7.5.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern Dry Forest

The following list of threats and priority conservation actions were identified for southern dry forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.5.3.2 unless otherwise indicated.

Threats and Issues

- Oak is succeeding to brush (both native and non-native species), eastern red cedar (on sites with thin or sandy soils, and south to southwest facing slopes), and to boxelder, elms, black cherry, and red maple in other locations where soils are loamier.
- Both old and young forests of this type are lacking.
- Historic management and grazing has led to type conversion. Pine plantations have been established in many areas.
- Grazing continues to remove understory and hinder oak regeneration.
- High grading is prevalent in this community type, and is causing the type to decline.
- Farmland and rural development have historically fragmented this community type, creating scattered woodlots.
- Gypsy moth may impact this community type.
- Invasives (e.g., buckthorns, Asian honeysuckles) are a major problem in some areas, often preventing regeneration.
- High deer densities and other factors may be affecting oak regeneration.
- Lack of fire contributes to regeneration problems in oak and associated understory species.
- Tax policies may be encouraging grazing of oak woodlots.

Priority Conservation Actions

- Preserve remaining older oak forests and manage them to control invasives.
- Seek opportunities to develop and maintain larger, older blocks of oak forest, and connect existing blocks.
- Restore oak forests on appropriate sites. Manage in the context of oak forest, oak woodland, and savanna in a gradient from forest to native or surrogate prairie grasslands.
- Maintain the diversity of oak species, including black, white, bur, and northern red oaks as appropriate for the site.
- Develop landowner incentives to preserve or restore this community type.
- Encourage use of prescribed fire to regenerate southern dry forests, including the associated understory vegetation of this type. Develop educational tools and demonstration areas that promote benefits of prescribed fire, and address liability concerns. Follow existing management guidelines for prescribed fires to minimize impacts on sensitive species.
- Encourage sustainable forest community management practices and oak regeneration. Recognize that this community type is an early-to-mid-successional stage that will require active management to sustain. Use demonstration areas for the public and develop a practical “toolkit” for regenerating oak.
- Conduct further study of the structural and species variability within oak forests, woodlands, and savannas, and how to regenerate these types.
- Investigate factors that lead to conversion to central hardwood species, and limit such conversion where sites have the potential to support rare species and Species of Greatest Conservation Need.
- Develop cost sharing incentives for landowners to burn and/or regenerate oak forests and oak woodland.

- Reduce deer density.
- Continue and support research to find biocontrols for invasives. Use management practices that limit the spread of new invasives.

3.3.7.5.3.2 Additional Considerations for Southern Dry Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern dry forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern dry forest found in Section 3.3.7.5.3.1.

Additional Considerations for Southern Dry Forest in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Southern Dry Forest

Central Sand Hills

The highest current relative importance values for white, black, and bur oak are found here as compared with forest species in other Ecological Landscapes. Exemplary sites include the Lawrence Creek Headwaters Area (Adams County) and Hawk Hill in Lodi Marsh Wildlife Area (Dane County). There are significant opportunities to maintain and restore southern dry forest in this Ecological Landscape. Eastern white pine is regenerating in the understory of some sites. These areas near the tension zone often exhibit characteristics of northern and southern dry forest, and Central Sands pine-oak forest. This type historically may have alternated with eastern white pine on several-hundred year intervals.

Central Sand Plains

Dry forests (southern dry forest, northern dry forest, Central Sands pine-oak forest) are a major opportunity in this Ecological Landscape. These areas near the Tension Zone often exhibit characteristics of all three types. Important sites include Bear Bluff, Black River State Forest (Jackson County), Necedah National Wildlife Refuge (Juneau County), and Quincy Bluff (Adams County). Eastern white pine is regenerating in the understory of some sites; this type historically may have alternated with eastern white pine on several-hundred year intervals.

Southeast Glacial Plains

The most important sites exist in the Kettle Moraine State Forest and vicinity. Other quality sites include the White River Sedge Meadow and Prairie (Green Lake County) and the Hawa Oak Woods and Prairie (Waukesha County). Invasive shrubs such as common buckthorn and Asian honeysuckles are a major problem in the Ecological Landscape.

Western Coulees and Ridges

Important sites include Badlands (Sauk County), Kickapoo Reserve (Vernon County), and Fort McCoy (Monroe County). Sites subject to repeated high grading or grazing may convert to central hardwoods, but sites on steep southwest and south-facing slopes with sandy soils may convert to eastern red cedar. Private landowners should be worked with to encourage maintenance of oak forests and oak woodland, and to limit loss of oak due to gypsy moth.

Additional Considerations for Southern Dry Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Southern Dry Forest

Southern Lake Michigan Coastal

There are limited opportunities in this Ecological Landscape, primarily for managing existing sites such as Bristol Park Woods (Kenosha County) and Waubeesee Woods (Racine County).

Southwest Savanna

Important sites include Blue Mound State Park (Iowa County), Browntown Oaks (Green County), and Weir White Oaks (LaFayette County).

3.3.7.6 Southern Dry-Mesic Forest

3.3.7.6.1 Community Overview

Red oak is a common dominant tree of this upland forest community type. White oak, basswood, sugar and red maples, white ash, shagbark hickory, and black cherry are also important. The herbaceous understory flora is diverse and includes many species listed under southern dry forest plus jack-in-the-pulpit, enchanter's-nightshade, large-flowered bellwort, interrupted fern, lady fern, tick-trefoils, and hog peanut.

Southern dry-mesic forests occur on loamy soils of glacial till plains and moraines, and on erosional topography with a loess cap, south of the tension zone. This community type was common historically, although white oak was considerably more dominant than red oak, and the type is still common today. However, to the detriment of the oaks, mesophytic tree species are becoming increasingly important under current management practices and fire suppression policies. Oak forests are succeeding to more mesic species (e.g., central and northern hardwood forest types), or to brush.

3.3.7.6.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Dry-Mesic Forest

Twenty-seven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with southern dry-mesic forest (Table 3-156).

Table 3-156. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with southern dry-mesic forest communities.

<i>Species Significantly Associated with Southern Dry-Mesic Forest</i>
Birds
Whip-poor-will
Acadian Flycatcher
Wood Thrush
Cerulean Warbler
Worm-eating Warbler
Louisiana Waterthrush
Hooded Warbler
Herptiles
Ornate Box Turtle
Black Rat Snake
Timber Rattlesnake
Mammals
Woodland Vole
<i>Species Moderately Associated with Southern Dry-Mesic Forest</i>
Birds
Red-shouldered Hawk
Yellow-billed Cuckoo
Red-headed Woodpecker
Veery
Blue-winged Warbler
Yellow-throated Warbler
Kentucky Warbler
Herptiles
Blanding's Turtle
Northern Prairie Skink
Western Worm Snake
Yellow-bellied Racer
Prairie Ringneck Snake
Bullsnake
Mammals
Northern Long-eared Bat
Eastern Red Bat
Gray Wolf

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-156 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern dry-mesic forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern dry-mesic forest in each of the Ecological Landscapes (Tables 3-157 and 3-158).

- Using the analysis described above, a species was further selected if it had both a significant association with southern dry-mesic forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern dry-mesic forest. These species are shown in Figure 3-33.

Table 3-157. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with southern dry-mesic forest communities and their association with Ecological Landscapes that support southern dry-mesic forest.

Southern Dry Mesic Forest	Birds (7)*							Herptiles (3)			Mammals (1)	
	Whip-poor-will	Acadian Flycatcher	Wood Thrush	Cerulean Warbler	Worm-eating Warbler	Louisiana Waterthrush	Hooded Warbler	Ornate Box Turtle	Black Rat Snake	Timber Rattlesnake	Woodland Vole	
MAJOR												
Central Sand Plains												
Southeast Glacial Plains												
Western Coulee and Ridges												
IMPORTANT												
Central Lake Michigan Coastal												
Central Sand Hills												
Southern Lake Michigan Coastal												
Southwest Savanna												
Western Prairie												
PRESENT (MINOR)												
Forest Transition												

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

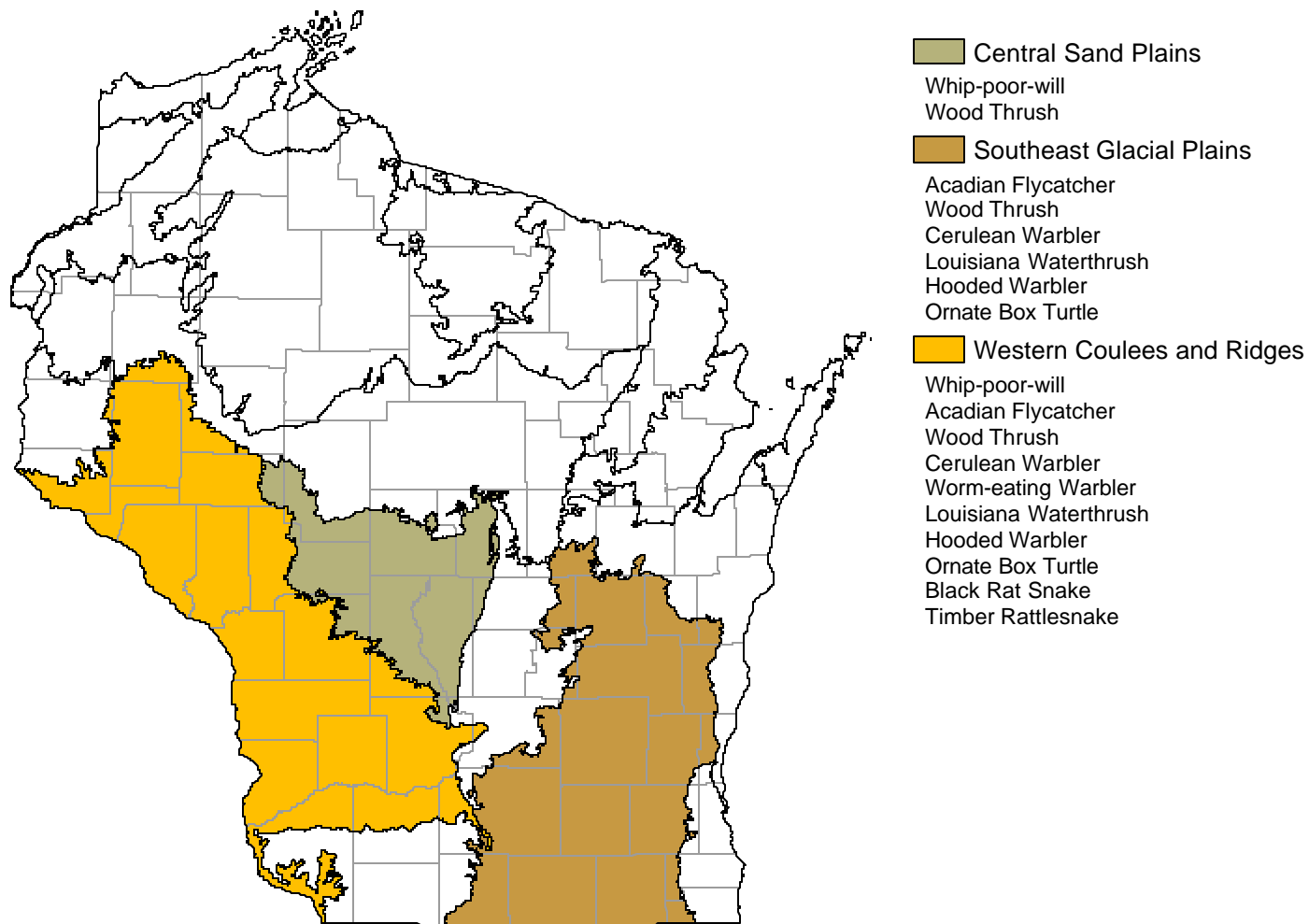
Table 3-158. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern dry-mesic forest communities and their association with Ecological Landscapes that support southern dry-mesic forest.

Southern Dry-Mesic Forest	Birds (7)*							Herptiles (6)					Mammals (3)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Red-shouldered Hawk	Yellow-billed Cuckoo	Red-headed Woodpecker	Veery	Blue-winged Warbler	Yellow-throated Warbler	Kentucky Warbler	Blanding's Turtle	Northern Prairie Skink	Western Worm Snake	Yellow-bellied Racer	Prairie Ringneck Snake	Bullsnake	Northern Long-eared Bat	Eastern Red Bat	Gray Wolf
MAJOR																
Central Sand Plains																
Southeast Glacial Plains																
Western Coulee and Ridges																
IMPORTANT																
Central Lake Michigan Coastal																
Central Sand Hills																
Southern Lake Michigan Coastal																
Southwest Savanna																
Western Prairie																
PRESENT (MINOR)																
Forest Transition																

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* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-33. Vertebrate Species of Greatest Conservation Need that have both a significant association with southern dry-mesic forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern dry-mesic forest.



3.3.7.6.3 Threats and Priority Conservation Actions for Southern Dry-Mesic Forest

3.3.7.6.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern Dry-Mesic Forest

The following list of threats and priority conservation actions were identified for southern dry-mesic forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.6.3.2 unless otherwise indicated.

Threats and Issues

- Past land clearing for agriculture has fragmented this community type, resulting in edge effects and isolation.
- Farmland and residential developments are typically interspersed with woodlots. Forests are being cleared for development as urban areas expand and residents seek solitude by developing housing in remaining rural areas. Land use planning that is not comprehensive and does not emphasize conservation considerations can lead to development in locations that limit options for this community. More information is needed to understand the effects of rural housing on these forest ecosystems.
- Lack of fire is affecting regeneration of oak and associated understory species.
- High deer densities are also affecting oak regeneration and some understory species.
- Both old and young forests of this type are lacking.
- Large blocks of this forest type are lacking.
- High grading is common, and is a factor in conversion of these forests to other types. The prevalent practice of removing trees as they approach old age diminishes development of important structural features and limits mast production important to wildlife.
- Grazing is removing understory and oak regeneration, and encourages the spread of invasives. Tax policy may be encouraging grazing of oak woodlots.
- Gypsy moth impacts may increase loss of this community type.
- Invasive plants (e.g., Asian honeysuckles, garlic mustard, multiflora rose, non-native buckthorns) are a major problem in some areas preventing oak regeneration.
- Conflicts exist regarding objectives for oak forests, which are difficult and expensive to regenerate, versus allowing conversion to central hardwoods.
- Savanna or open land objectives sometimes also compete with forest objectives.

Priority Conservation Actions

- Preserve remaining older southern dry-mesic forests and manage them to control invasives. Seek opportunities to develop and maintain larger, older blocks of this type, or connect existing blocks.
- Restore oak forests on appropriate sites.
- Manage for southern-dry mesic forest within the context of dry oak forest and savanna in a gradient from forest to native grassland.
- Maintain a component of white and bur oaks as well as red oak in this community type.
- Encourage sustainable forest community management practices and oak regeneration. Recognize that this community type is an early-to-mid-successional stage that will require active management to maintain. Use demonstration areas for the public and develop a practical “toolkit” for regenerating oak.
- Eliminate the practice of high grading.
- Encourage use of prescribed fire to regenerate these forest communities, using education and limiting liability concerns. Offer incentives for conducting prescribed burns and oak regeneration to help maintain this community type. Follow existing management guidelines for prescribed fires to minimize impacts on sensitive species.

- Monitor management activities to ensure oak regeneration success and follow up as needed.
- Limit grazing in this community type.
- Encourage sustainable land use practices that limit fragmentation of this type.
- Collect information on the effects of rural housing development on the community.
- Reduce deer density, where possible.
- Control and eliminate invasives, where possible. Continue and support research to find biocontrols for invasives; control the spread of new invasives.
- Consider management actions to control gypsy moth outbreaks to maintain oak forests on sites with high conservation value, taking care to not negatively affect other sensitive species.

3.3.7.6.3.2 Additional Considerations for Southern Dry-Mesic Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern dry-mesic forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern dry-mesic forest found in Section 3.3.7.6.3.1.

Additional Considerations for Southern Dry-Mesic Forest in Ecological Landscapes with *Major* Opportunities for Protection, Restoration, and/or Management of Southern Dry-Mesic Forest

Central Sand Plains

This type is not extensive in the Ecological Landscape, but some significant sites occur within the matrix of dry forest communities. Opportunities exist to maintain large blocks of oak forest in the Black River State Forest (Jackson County), Clark County Forest, Jackson County Forest, Quincy Bluff State Natural Area (Adams County), and Mill Bluff State Natural Area (Juneau County). Existing sites should be connected to other blocks of forest where possible.

Southeast Glacial Plains

Significant patches of the community type exist in both the Southern (Walworth, Jefferson, and Waukesha Counties) and Northern Units of the Kettle Moraine (Washington, Fond du Lac, and Sheboygan Counties); these may represent the best opportunities to manage for large blocks of oak forest in southeast Wisconsin. Other sites that have this community type include Hook Lake Bog (Dane County), and Millhome Forest (Manitowoc County). Opportunities to develop larger, older blocks of oak forest, and/or connect existing blocks should be sought. Remnants of old oak forests should be preserved and managed to control invasives. Some native species such as prickly ash, dogwoods, grapevines, and cherries can become aggressive in these communities in the absence of fire. Deer densities should be reduced where feasible and other factors affecting oak regeneration should be explored and addressed. Rural housing development is occurring at an especially rapid rate in this Ecological Landscape, and opportunities to promote sustainable development are desirable.

Western Coulees and Ridges

There are many opportunities to manage this community type on both public and private lands in this Ecological Landscape. Larger blocks of oak forest in the Middle and Lower Kickapoo Watershed (including the Kickapoo Valley Reserve; Vernon and Crawford Counties), the Baraboo Hills (including Devil's Lake State Park and the Badger Army Ammunition Plant; Sauk and Columbia Counties), Rush Creek State Natural Area (Crawford County), and Lower Wisconsin Riverway (Dane, Iowa, Grant, Sauk,

Richland, and Crawford Counties) should be maintained. There are opportunities to maintain this community type on private land through Managed Forest Law and other private lands forestry programs.

Additional Considerations for Southern Dry-Mesic Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Southern Dry-Mesic Forest

Central Lake Michigan Coastal

Although southern dry-mesic forests are not widespread in this Ecological Landscape, there is an opportunity to maintain a large, older block of oak forest along the lower Wolf River. Other sites occur at Fairy Chasm (Ozaukee County) and Waldkirch Oak Woods (Brown County).

Central Sand Hills

Several significant sites of this community type occur in this Ecological Landscape. They occur at Gibraltar Rock State Natural Area and Otsego Oak-Maple Woods (Columbia County), Caves Creek Fisheries Area and Fox River Crane Marsh (Marquette County), and Mud Lake-Radley Creek Savanna State Natural Area (Waupaca County).

Southwest Savanna

Several opportunities exist to manage southern dry-mesic forests in this Ecological Landscape. Examples of the community type exist at Browntown Oak Forest State Natural Area and New Glarus Woods State Natural Area (Green County), Weir White Oaks State Natural Area and Yellowstone Wildlife Management Area (Lafayette County), and Pecatonica River Woods State Natural Area (Iowa County).

Southern Lake Michigan Coastal

Examples of this community type are found at Cudahy Woods State Natural Area and Fall Park Woods (Milwaukee County), Bishop's Woods and Muskego Park Hardwoods (Waukesha County), Silver Lake Bog State Natural Area (Kenosha County), and Sander's Park Hardwoods State Natural Area (Racine County). River corridors offer the best opportunities to develop forest connectivity. In urban settings, encourage planting of oaks in parks and adjacent to existing urban woodlands. The native prickly ash, dogwoods, grapevine, and cherries are aggressive in the absence of fire. High deer densities and other factors may be affecting oak regeneration, particularly in urban park areas.

Western Prairie

This community type occurs on bluffs along the St. Croix River where it would have historically been protected from frequent fire disturbance. Larger blocks of oak forest along the St. Croix River bluffs, in areas east of the Willow River, and along the Kinnickinnic River should be maintained. Management should occur within the context of floodplains, southern mesic forest, dry oak forest and savanna in a gradient from forests to native and surrogate prairie grasslands. Urban expansion is occurring in this Ecological Landscape; housing developments can impact this community directly and also limit opportunities to manage with prescribed fire.

3.3.7.7 Southern Hardwood Swamp

3.3.7.7.1 Community Overview

This is a deciduous forested wetland community type found in insular basins with seasonally high water tables. This type is best developed in glaciated southeastern Wisconsin, but was not of large extent even prior to EuroAmerican settlement. Finley (1976) classified less than 1% of southeastern Wisconsin as lowland hardwood forest, and this figure includes bottomland forests along rivers as well as hardwood swamps in closed basins. Dominant tree species are red maple, green and black ashes, and formerly, American elm. Another species that also occurs in these forests is silver maple, as well as hybrids of red and silver maples. Southern hardwood swamps are noted for a high component of lianas, including poison ivy, Virginia creepers, and grapes. In the relatively undisturbed sites, there can be a rich spring flora. Microtopographic differences account for the existence of patches of spring ephemerals as well as many wetland species. The exotic reed canary grass has become dominant in the understory of many hardwood swamps.

This Natural Heritage Inventory community type partly includes the southern wet-mesic forest of the Curtis (1959) classification. Curtis describes these types as occurring on lake plains, both around the margins of larger existing lakes and on extinct glacial lakes. He referred to them as “lacustrine forests”, and noted that their soils have a high organic matter content, approaching peat conditions. This differentiates them in part from floodplain forests where processes of flooding and scouring tend to remove organic detritus. Also, in floodplains, much of the water movement is lateral, while in hardwood swamps the water table tends to fluctuate vertically. Southern hardwood swamps are not necessarily restricted to lake plains; some occur in lower-lying portions of till plains that may not have held ponded water for any significant length of time during or after glaciation.

3.3.7.7.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Hardwood Swamp

Fourteen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with southern hardwood swamp (Table 3-159).

Table 3-159. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with southern hardwood swamp communities.

<i>Species Significantly Associated with Southern Hardwood Swamp</i>	
Birds	
Rusty Blackbird	
Herptiles	
Four-toed Salamander	
<i>Species Moderately Associated with Southern Hardwood Swamp</i>	
Birds	
Yellow-crowned Night Heron	
Yellow-billed Cuckoo	
Herptiles	
Pickerel Frog	
Wood Turtle	
Blanding's Turtle	
Black Rat Snake	
Timber Rattlesnake	
Eastern Massasauga Rattlesnake	
Mammals	
Water Shrew	
Northern Long-eared Bat	
Eastern Red Bat	
Woodland Jumping Mouse	

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-159 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern hardwood swamp and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern hardwood swamp in each of the Ecological Landscapes (Tables 3-160 and 3-161).
- Using the analysis described above, a species was further selected if it had both a significant association with southern hardwood swamp and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern hardwood swamp. These species are shown in Figure 3-38.

Table 3-160. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with southern hardwood swamp communities and their association with Ecological Landscapes that support southern hardwood swamp.

Southern Hardwood Swamp Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (1)*	Herpetiles (1)
	Rusty Blackbird	Four-toed Salamander
MAJOR		
Southeast Glacial Plains		
IMPORTANT		
Southern Lake Michigan Coastal		
PRESENT (MINOR)		
Central Lake Michigan Coastal		
Western Coulee and Ridges		

Color Key

	= HIGH probability the species occurs in this Ecological Landscape
	= MODERATE probability the species occurs in this Ecological Landscape
	= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-161. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern hardwood swamp communities and their association with Ecological Landscapes that support southern hardwood swamp.

Southern Hardwood Swamp												
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (2)*		Herptiles (5)					Mammals (4)				
	Yellow-crowned Night-Heron	Yellow-billed Cuckoo	Pickerel Frog	Wood Turtle	Blanding's Turtle	Black Rat Snake	Timber Rattlesnake	Eastern Massasauga Rattlesnake	Water Shrew	Northern Long-eared Bat	Eastern Red Bat	Woodland Jumping Mouse
MAJOR												
Southeast Glacial Plains												
IMPORTANT												
Southern Lake Michigan Coastal												
PRESENT (MINOR)												
Central Lake Michigan Coastal												
Western Coulee and Ridges												

Color Key

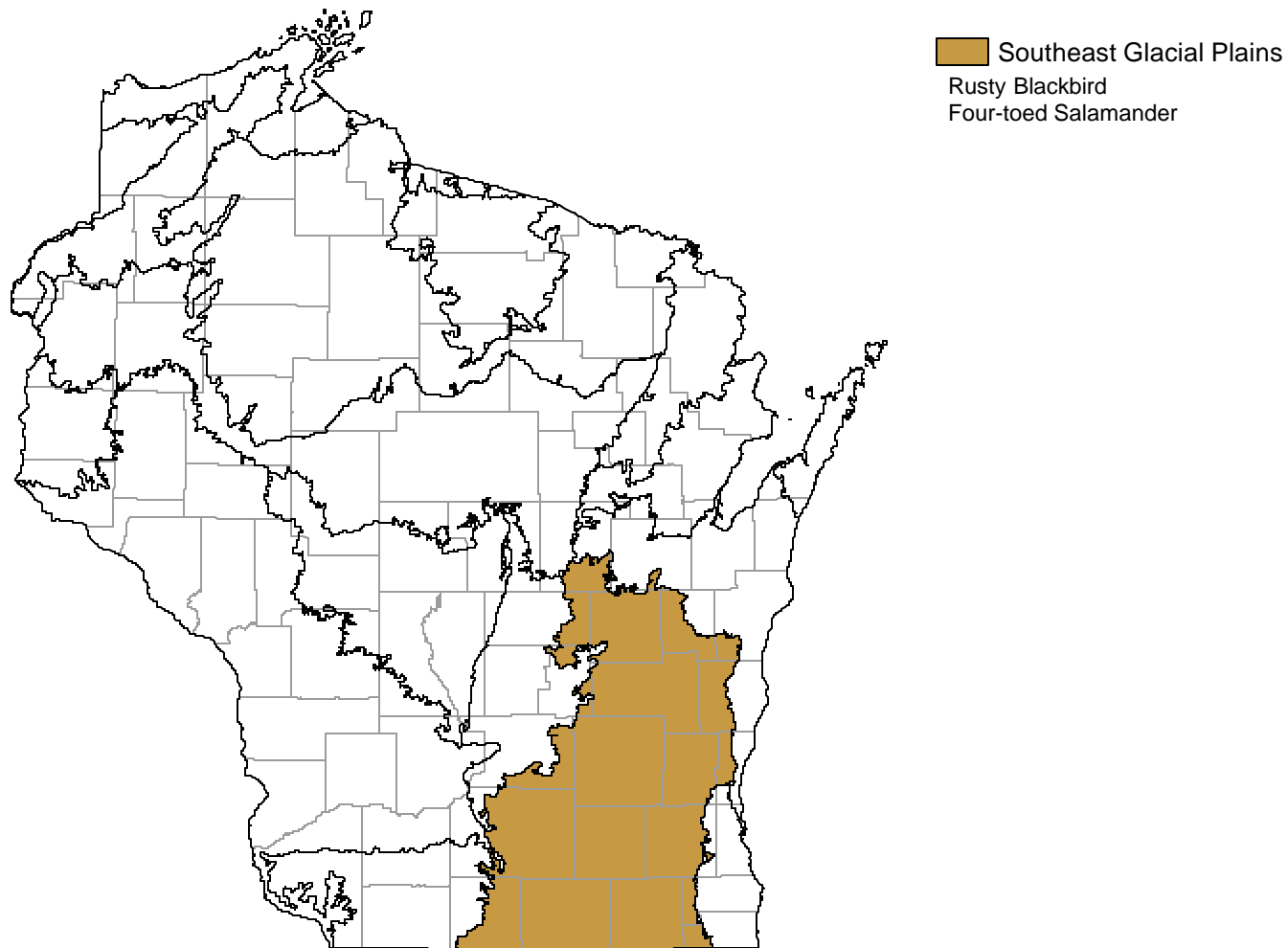
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-38. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with southern hardwood swamp *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern hardwood swamp.



3.3.7.7.3 Threats and Priority Conservation Actions for Southern Hardwood Swamp

3.3.7.7.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern Hardwood Swamp

The following list of threats and priority conservation actions were identified for southern hardwood swamp in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.7.3.2 unless otherwise indicated.

Threats and Issues

- Threats to these communities include past land use conversion to agriculture, including ditching, which has altered hydrology and contributed to sedimentation, nutrient loading, and pollution. These impacts lead to changes in vegetative composition and encourage invasive plants, particularly reed canary grass.
- Agriculture and development have isolated the swamp forests, which formerly occurred within a landscape matrix of oak savanna, oak or maple forests, and open wetlands.
- Grazing has led to additional simplification, and encouraged the expansion of invasive plants.
- Unsustainable forest management practices can alter species composition, or result in loss of forests to reed canary grass.
- Silvicultural techniques do not provide consistent regeneration of the swamp hardwood forest. More information is needed to manage this type, which may be in a phase of reorganization due to the loss of American elm as an overstory species in the aftermath of Dutch Elm Disease. These sites are vulnerable to invasions of non-native species when the canopy is opened.
- The emerald ash borer is a major threat to ash trees, and their loss could lead to further changes in composition and function of these communities.
- Invasive strains of giant reed grass could become a problem in these communities in the future.

Priority Conservation Actions

- Preserve the few existing sites; protect them from hydrologic changes, and from runoff that contributes to sedimentation, nutrient loading, and pollution.
- Use buffers to reduce sedimentation.
- Use management practices that do not lead to the spread of reed canary grass and other invasive species.
- Limit development around existing and restorable sites.
- Where possible, manage this community type within a matrix of other forest types, savannas, surrogate grasslands and other semi-natural habitats.
- Manage as large blocks, or maintain and restore connectivity to other hardwood swamps where possible.
- Prevent grazing.
- Develop monitoring systems and support research that will lead to a better understanding of the composition, disturbance regimes, and dynamics that are part of this system.
- Research into silvicultural systems is needed to sustainably manage and regenerate these forests.
- Additional inventory work is needed to locate and document existing or restorable sites.

3.3.7.7.3.2 Additional Considerations for Southern Hardwood Swamp by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern hardwood swamp exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern hardwood swamp found in Section 3.3.7.7.3.1.

Additional Considerations for Southern Hardwood Swamp in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Southern Hardwood Swamp

Southeast Glacial Plains

The North Unit of the Kettle Moraine State Forest includes some acreage of the southern hardwood swamp community type, though the area also includes species such as yellow birch and occasionally northern white cedar that are typically found in northern hardwood swamps. In this Ecological Landscape, the southern hardwood swamp type tends to be transitional to more northern types; this may be, in part, a tension zone effect. The Cedarburg Bog area contains occurrences of this type adjacent to conifer bogs, and they are also found in a hydrologically connected wetland to the north of the string bogs. Huiras Lake in Washington County is a site with swamp hardwoods occurring around an undeveloped lake and its associated conifer swamp. Intact or high-quality hardwood swamps are very rare. More survey work and better documentation are needed, and restoration techniques should be developed for degraded sites.

Additional Considerations for Southern Hardwood Swamp in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Southern Hardwood Swamp

Southern Lake Michigan Coastal

Whitnall Park Woods, in the city of Franklin and village of Hales Corners, contains patches of southern hardwood swamp. Limited opportunities occur in some of the basins and perhaps in association with smaller streams which lack well-developed floodplains. Additional inventory work is needed.

3.3.7.8 Southern Mesic Forest

3.3.7.8.1 Community Overview

This upland forest community occurs on rich, well-drained loamy soils, mostly on glacial till plains or loess-capped sites south of the tension zone. The dominant tree species is sugar maple, but basswood, and near Lake Michigan, American beech may be co-dominant. Many other trees are found in these forests, including those of the walnut family, ironwood, red oak, red maple, white ash, and slippery elm. The understory is typically open, or sometimes brushy with species of gooseberry on sites with a history of grazing, and supports fine spring ephemeral displays. Characteristic herbs are spring-beauty, trout-lilies, trilliums, violets, bloodroot, blue cohosh, mayapple, and Virginia waterleaf.

Historically, southern mesic forests were quite common throughout southern Wisconsin. For example, forests dominated by sugar maple or beech occupied 41% of the Southern Lake Michigan Coastal, 25% of the Southeast Glacial Plains, and 18% of the Western Coulees and Ridges Ecological Landscapes (Finley 1976). Most of these forests were cleared for agriculture, as the soils are very fertile.

3.3.7.8.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Mesic Forest

Twenty-four vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with southern mesic forest (Table 3-162).

Table 3-162. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with southern mesic forest communities.

<i>Species Significantly Associated with Southern Mesic Forest</i>
Birds
Acadian Flycatcher
Wood Thrush
Louisiana Waterthrush
Kentucky Warbler
Hooded Warbler
Herptiles
Four-toed Salamander
Black Rat Snake
Timber Rattlesnake
<i>Species Moderately Associated with Southern Mesic Forest</i>
Birds
Red-shouldered Hawk
Yellow-billed Cuckoo
Veery
Blue-winged Warbler
Cerulean Warbler
Worm-eating Warbler
Herptiles
Pickerel Frog
Wood Turtle
Blanding's Turtle
Ornate Box Turtle
Bullsnake
Mammals
Water Shrew
Northern Long-eared Bat
Eastern Red Bat
Woodland Jumping Mouse
Gray Wolf




In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-162 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern mesic forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern mesic forest in each of the Ecological Landscapes (Tables 3-163 and 3-164).
- Using the analysis described above, a species was further selected if it had both a significant association with southern mesic forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern mesic forest. These species are shown in Figure 3-39.

Table 3-163. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with southern mesic forest communities and their association with Ecological Landscapes that support southern mesic forest.

Southern Mesic Forest Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (5)*					Herptiles (3)		
	Acadian Flycatcher	Wood Thrush	Louisiana Waterthrush	Kentucky Warbler	Hooded Warbler	Four-toed Salamander	Black Rat Snake	Timber Rattlesnake
MAJOR								
Western Coulee and Ridges								
IMPORTANT								
Central Lake Michigan Coastal								
Central Sand Plains								
Southeast Glacial Plains								
Southern Lake Michigan Coastal								
Southwest Savanna								
Western Prairie								
PRESENT (MINOR)								
Central Sand Hills								
Forest Transition								
Northern Lake Michigan Coastal								

Color Key

-  = HIGH probability the species occurs in this Ecological Landscape
-  = MODERATE probability the species occurs in this Ecological Landscape
-  = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-164. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern mesic forest communities and their association with Ecological Landscapes that support southern mesic forest.

Southern Mesic Forest	Birds (6)*						Herptiles (5)					Mammals (5)				
	Red-shouldered Hawk	Yellow-billed Cuckoo	Veery	Blue-winged Warbler	Cerulean Warbler	Worm-eating Warbler	Pickered Frog	Wood Turtle	Blanding's Turtle	Ornate Box Turtle	Bullsnake	Water Shrew	Northern Long-eared Bat	Eastern Red Bat	Woodland Jumping Mouse	Gray Wolf
MAJOR																
Western Coulee and Ridges																
IMPORTANT																
Central Lake Michigan Coastal																
Central Sand Plains																
Southeast Glacial Plains																
Southern Lake Michigan Coastal																
Southwest Savanna																
Western Prairie																
PRESENT (MINOR)																
Central Sand Hills																
Forest Transition																
Northern Lake Michigan Coastal																

Color Key

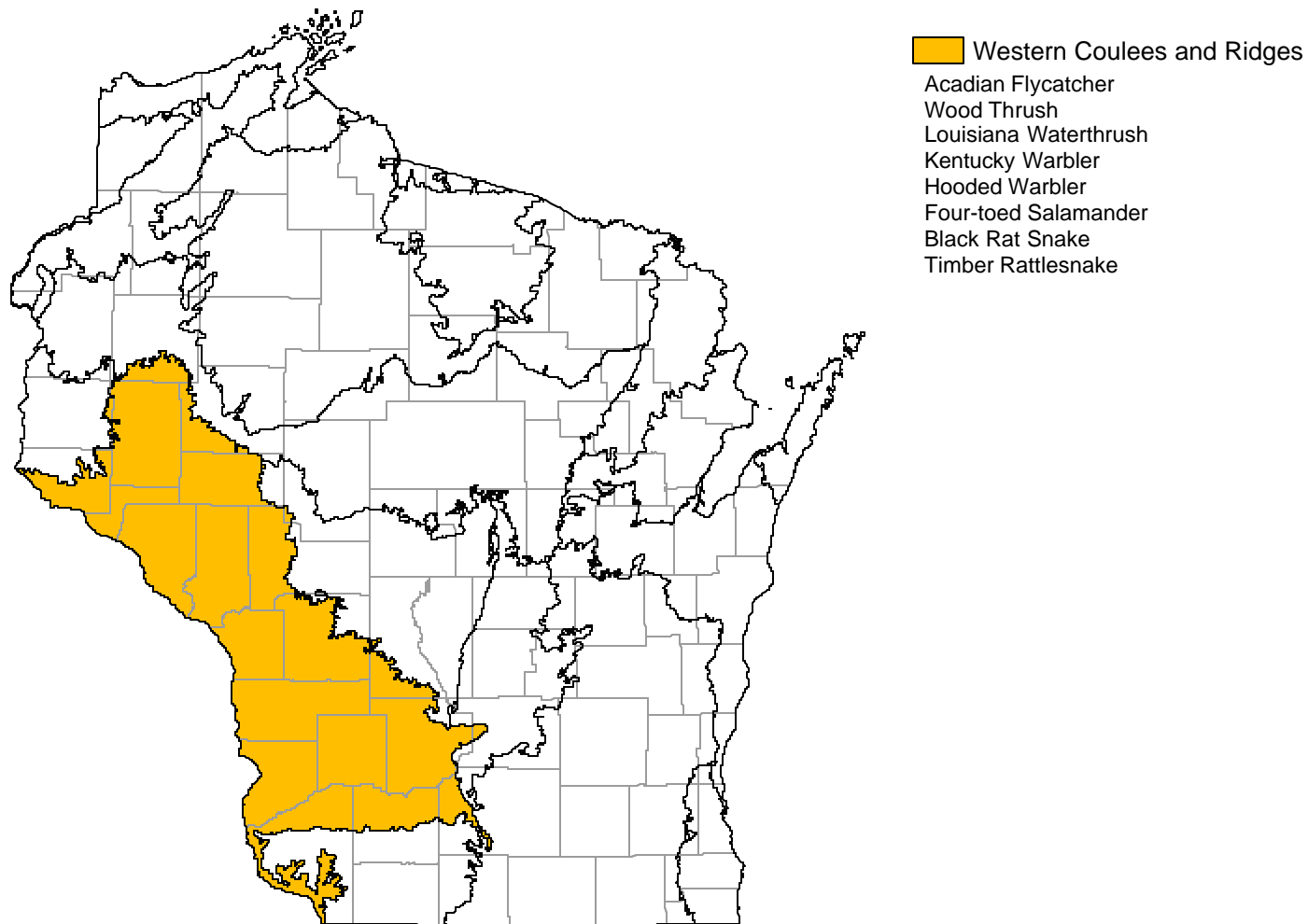
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-39. Vertebrate Species of Greatest Conservation Need that have both a significant association with southern mesic forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern mesic forest.



3.3.7.8.3 Threats and Priority Conservation Actions for Southern Mesic Forest

3.3.7.8.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern Mesic Forest

The following list of threats and priority conservation actions were identified for southern mesic forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.8.3.2 unless otherwise indicated.

Threats and Issues

- Past conversion to agriculture has diminished the extent of this community type, which limits future management options.
- Of the remaining forests, older age-classes are lacking.
- Woodlots are fragmented and isolated by farmland and rural housing.
- Land use planning that is not comprehensive and does not emphasize conservation considerations can lead to development in locations that limit options for this community.
- Changes in forest composition and structure are occurring due to forest management practices, grazing, and invasive species, resulting in increasing dominance of red maple, boxelder, and ironwood.
- Invasives are a major problem in some areas and may limit regeneration (e.g., buckthorns, garlic mustard).
- Grazing is removing understory and regeneration, and encourages the spread of invasive species.
- High deer densities may be affecting regeneration of some species and shifting composition.

Priority Conservation Actions

- Maintain larger blocks of this type where present.
- Maintain a component of oak species within this type where feasible and appropriate.
- Use other forest types to buffer and maintain contextual continuity, limit edge effects, and maximize benefits for area sensitive species.
- Use Best Management Practices and other sustainable forest community management practices.
- Reduce deer density.
- Continue and support research to find biocontrols for invasives, and use management techniques that limit the spread of invasives.

3.3.7.8.3.2 Additional Considerations for Southern Mesic Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern mesic forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern mesic forest found in Section 3.3.7.8.3.1.

Additional Considerations for Southern Mesic Forest in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Southern Mesic Forest

Western Coulees and Ridges

Operations on steep slopes can cause rutting, soil erosion, and contribute to hydrologic changes such as overland flow. Large blocks of this type should be maintained where present (e.g., Baraboo Hills, Lower and Middle Kickapoo Watershed, Lower Wisconsin Riverway). Sauk, Richland, and Vernon counties contain the larger blocks. Significant areas (due to species composition) include those south of the

Wisconsin River in Grant County, where dolomite bedrock occurs. Floristically these forests are often very rich and support species not common in the rest of the Ecological Landscapes.

Additional Considerations for Southern Mesic Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Southern Mesic Forest

Central Lake Michigan Coastal

Large blocks of this type should be maintained where present along the lower Wolf River. Sites in the southeast where beech is a co-dominant should also be maintained.

Central Sand Plains

This type should be embedded within large blocks of other forest types that are more common in this Ecological Landscape.

Southeast Glacial Plain

Past land clearing for agriculture has reduced and fragmented this community type, resulting in edge effects and isolation. Forests are being cleared for development as urban areas expand and residents seek solitude by developing housing in remaining rural areas.

Larger blocks of this type should be maintained where present (e.g., North Unit Kettle Moraine, where the type is mixed with dry-mesic forests). A component of beech and oak species should also be maintained within this type where appropriate and feasible. This community type is often found in association with outcrops of the Niagara Escarpment. The Niagara Escarpment is a regionally significant repository of highly specialized rare species (e.g., land snails). It supports microhabitats that do not occur elsewhere, contributing to occurrences of embedded localized community types such as moist cliff. More survey work is needed to document the variability of these communities (i.e., to differentiate between sites in North Kettle Moraine and on the Niagara Escarpment). Millhome Woods in southern Manitowoc County is another large site that supports southern mesic forest.

Southern Lake Michigan Coastal

This type has been severely reduced from its past extent. Manage this type as a complex with other forest types along river corridors (e.g., Root River).

Southwest Savanna

Operations on steep slopes can cause rutting, soil erosion, and contribute to hydrologic changes such as overland flow.

Western Prairie

Urban expansion is occurring within the Western Prairie Ecological Landscape, and housing developments can directly impact this community. Historically this community type occupied a large portion of the eastern part of the Ecological Landscape. Existing forests are scattered; additional fragmentation of existing forests along river corridors should be avoided.

3.3.7.9 Southern Tamarack Swamp

3.3.7.9.1 Community Overview

The 'southern tamarack swamp' community is similar to 'northern wet forest' but less acidic, supporting understory associates that are more nutrient-demanding and tolerant of higher pH levels. Tamarack is the dominant tree, though in some stands hardwoods such as paper birch, red maple, black ash, or American elm may be present as associates, saplings, or as subcanopy trees. The understory is more diverse and structurally complex than in the more acid spruce-dominated swamps and includes nutrient-demanding species such as speckled alder, bog holly, winterberry holly, and black ash. Poison sumac is the most abundant tall shrub in many southern Wisconsin tamarack forests. The bryophytes may include many genera other than *Sphagnum*.

Stands that are fed by spring seepage sometimes support plants such as marsh-marigold, cinnamon fern, royal fern, and skunk-cabbage. These seepage stands have been separated out as a distinct type or subtype in some nearby states and provinces. In Wisconsin, the tamarack seepage swamps occur statewide but may be more common south of the tension zone. Historically, tamarack swamps occurred extensively in parts of southeastern Wisconsin and on the margins of Glacial Lake Wisconsin. Many of the swamps were drained and cleared for agricultural purposes. Intact examples are now uncommon but occur in a wide variety of settings, such as on the margins of lakes or streams, at the base of moraines, in outwash areas, and in a few Driftless Area stream valleys.

3.3.7.9.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Tamarack Swamp

Twenty-four vertebrate Species of Greatest Conservation Need were identified as moderately associated with southern tamarack swamp (Table 3-165). There were not any vertebrate Species of Greatest Conservation Need that were identified as significantly associated with southern tamarack swamps.

Table 3-165. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately associated with southern tamarack swamp communities.

Birds

American Woodcock
Black-billed Cuckoo
Blue-winged Warbler
Rusty Blackbird

Herptiles

Four-toed Salamander
Blanding's Turtle

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-165 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern tamarack swamp and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern tamarack swamp in each of the Ecological Landscapes (Tables 3-166).

Table 3-166. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern tamarack swamp communities and their association with Ecological Landscapes that support southern tamarack swamp.

Southern Tamarack Swamp Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (4)*				Herptiles (2)	
	American Woodcock	Black-billed Cuckoo	Blue-winged Warbler	Rusty Blackbird	Four-toed Salamander	Blanding's Turtle
MAJOR						
Southeast Glacial Plains						
IMPORTANT						
Central Sand Hills						
Central Sand Plains						
Southern Lake Michigan Coastal						
Western Coulee and Ridges						

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

3.3.7.9.3 Threats and Priority Conservation Actions for Southern Tamarack Swamp

3.3.7.9.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern tamarack swamp

The following list of threats and priority conservation actions were identified for southern tamarack swamp in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.9.3.2 unless otherwise indicated.

Threats and Issues

- Road construction, agriculture, and development can alter hydrology to the detriment of this community type. Associated impacts from sedimentation, pollutants, and pesticides can also affect the community.
- When hydrologic changes and other impacts occur, this community can convert to shrub swamp.
- Unsustainable forest management and agricultural practices can result in soil compaction, soil erosion, water quality issues, invasive species establishment, and regeneration problems.
- More information is needed to understand how to manage this type and assess the impacts of management activities.
- Fragmentation, at both the stand and landscape levels, can be an issue locally.
- Invasive plants are a serious problem in some Ecological Landscapes, and should be monitored and controlled. Glossy buckthorn (*Rhamnus frangula*) has recently become a major problem in tamarack swamps in the southern parts of Wisconsin.
- Tamarack is often declining and failing to regenerate in southern regions for reasons that are not always clear.
- A number of insect pests (e.g., larch sawfly) can decimate tamarack forests.
- Many tamarack swamps in the southern Ecological Landscapes were formerly grazed, and at least partially drained to create muck farms or pasture.

Priority Conservation Actions

- This type requires more survey work to better describe and document occurrences, and determine the status of associated rare species. Basic vegetation studies are needed for conifer swamps throughout Wisconsin, to better document composition and structure, to determine the status and distributions of negative impacts due to hydrologic alterations and colonization by invasive plants, and to develop a classification that better reflects the range of natural variability.
- Existing information on the animal life of southern tamarack swamp should be published and made available to land managers and planners.
- Southern tamarack stands should be studied to determine reasons for decline.
- The role of periodic wildfire in maintaining and regenerating tamarack swamps is not well understood, but may have been important in some parts of southern Wisconsin historically. The present exclusion of fire may be playing a role in altered successional pathways that appear to be leading to increased dominance by hardwoods and tall shrubs, at least some of which are fire-sensitive.
- Land use planning that maintains or restores the natural hydrologic regimes that support this forest type is needed.
- Where feasible, manage this forest type with other forest and wetland communities. In some parts of southern Wisconsin, tamarack swamps were historically bordered by oak savanna and prairie. Isolated sites should be embedded in other complementary habitats, or buffered from land uses that can degrade them.
- Opportunities to manage for boreal birds, *Lepidoptera*, and other taxa are important and can contribute greatly to regional diversity; additional survey work should clarify the status of some of these species and enable conservationists to better prioritize protection and management projects.

WDNR's 'Peatlands Project' is expected to yield additional information on this type (along with other peatland communities).

- Large blocks of this habitat are needed by some habitat specialists, and these blocks should be priorities for protection where they occur.
- Best Management Practices and other sustainable forest management practices should be used to limit soil damage, erosion, sedimentation, and hydrologic changes.
- Continue to support research to find biocontrols for invasives. Use management practices that limit the spread of new invasives into the community type.

3.3.7.9.3.2 Additional Considerations for Southern Tamarack Swamp by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern tamarack swamp exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern tamarack swamp found in Section 3.3.7.9.3.1.

Additional Considerations for Southern tamarack swamp in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Southern Tamarack Swamp

Southeast Glacial Plains

Invasive non-native plants are a major problem in southern tamarack stands (e.g., glossy buckthorn). Poison sumac can be quite common in this community, making it difficult to work in this type here. Declining tamarack stands are frequently not regenerating. Fragmentation and stand isolation are significant issues in this EL.

Large stands occur in Jefferson County, in the Mukwonago River watershed, and at a few other locations. Past drainage to create muck farms and pasture eliminated much of the swamp conifer community in the Ecological Landscape. Rare species include northern plants and animals at their southern range limits, but also some that are most often associated with southern "fen" habitats. Fire may have played an important role in maintaining this type historically. Some stands appear to be succeeding to hardwoods such as red maple. Restoration techniques need to be developed for this "type" (using the term broadly) in the southern part of its range.

Additional Considerations for Southern Tamarack Swamp in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Southern Tamarack Swamp

Central Sand Hills

Changes in hydrology due to development can be detrimental to this community type here, and there are continuing effects from past hydrologic changes (e.g., ditching, dike construction, road building, etc.). Some agricultural practices can result in soil erosion and water quality problems. Habitat fragmentation and stand isolation can affect this type in central and southern Wisconsin.

Central Sand Plains

The effects of past land use (e.g., wetland drainage, dike and impoundment construction) have impacted hydrology. Some of these uses continue today, where waterfowl production is emphasized, or to meet the needs of specialized agricultural uses such as cranberry production. Fragmentation and stand isolation are issues in the eastern part of the Ecological Landscape. Recovery potential of tamarack swamps in areas where the hydrology has been significantly altered is uncertain and needs to be clarified.

Large blocks of this habitat still exist in some areas, and some of them occur within extensive upland forests. Sites in the eastern part of the Ecological Landscape should be blocked and/or buffered. The best opportunities for developing blocks and connecting corridors are in the central and western parts of the Ecological Landscape, in the Black River State Forest, and on the Jackson, Wood, and Clark County Forests. Incentives, or other means of achieving conservation objectives, that meet the needs of cranberry growers and other large landowners of this type within this region should be developed. Additional vegetation sampling is needed in central Wisconsin to determine whether tamarack forests should be included with *southern* stands or *northern* stands.

Southern Lake Michigan Coastal

Invasives are a significant problem in southern tamarack stands. Black spruce does not occur this far south and the “northern” understory is represented by a very reduced subset of plants. Often, declining stands are not regenerating. Stand isolation and fragmentation are major issues. High deer densities, fire suppression, and succession may all be affecting species composition and stand structure.

This type is extremely limited in this Ecological Landscape. Large blocks of this habitat are needed, but there are few opportunities here. Isolated sites should be embedded in other forest habitats where possible, or buffered. More survey work is needed to assess the current condition of known stands, most of which have been referred to as ‘*bog relicts*’ in the past. Restoration techniques for this type in southern Wisconsin should be developed.

Western Coulees and Ridges

The known occurrences are small and impacted by agricultural runoff (e.g., excess nutrients and sediments). Often, tamarack is declining and not regenerating. Stand isolation within formerly forested lands that were cleared for agricultural uses is a significant issue, as is the spread of invasive species.

This community type is of limited extent in this Ecological Landscape. Opportunities exist to manage for a limited suite of northern species. More detailed survey work is needed to clarify the significance of these sites for sensitive species. Tamarack sites should be blocked and/or buffered where possible. Community viability is questionable for some stands.

3.3.7.10 White Pine – Red Maple Swamp

3.3.7.10.1 Community Overview

Known occurrences of this forested wetland community are concentrated in and around the bed of extinct Glacial Lake Wisconsin, in the Central Sand Plains Ecological Landscape. Stands occur along the upper reaches of low gradient headwaters streams, or as a zone of vegetation at the wetland-upland interface on the margins of the large acid peatlands that are prominent features in central Wisconsin. The type is not of large extent within the state. Eastern white pine and red maple are the dominant trees, with other species, including yellow birch, black ash, and tamarack present in lesser amounts. Common understory shrubs are speckled alder, winterberry holly, dewberries (*Rubus hispidus*, and *R. pubescens*), and poison sumac; characteristic herbs include skunk cabbage, cinnamon fern, gold thread, and two disjuncts from the eastern United States, bog fern and long sedge. Sphagnum mosses and liverworts are common in some stands, and can form an almost continuous carpet over extensive areas.

Seepages and spring runs are often present, providing important microhabitats for invertebrates, herptiles, and plants. This community occupies a landscape position between wet acid peatlands forested with tamarack and black spruce, and dry forests composed of mixtures of pines and oaks. Transitions to the upland forests can be abrupt, with a sudden shift in the dominance of understory composition of wetland shrubs, herbs, and mosses, to dominance by bracken fern, blueberries (*Vaccinium angustifolium* and *V. myrtilloides*), huckleberry, and Pennsylvania sedge. Because this type has characteristics of an ecotone, with spatially variable microsites, high levels of ground cover, connectivity between wetland and upland communities, and uncommon structural features as compared with the surrounding landscape, it supports an unusual mix of faunal species with high conservation value (e.g., red-shouldered hawk, amphibians, reptiles, and many species of neotropical migrant birds).

3.3.7.10.2 Vertebrate Species of Greatest Conservation Need Associated with White Pine – Red Maple Swamp

Eleven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with white pine – red maple swamp (Table 3-167).

Table 3-167. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with white pine– red maple swamp communities.

<i>Species Significantly Associated with White Pine – Red Maple Swamp</i>	
Birds	
Veery	
<i>Species Moderately Associated with White Pine – Red Maple Swamp</i>	
Birds	
Northern Goshawk	
Red-shouldered Hawk	
Canada Warbler	
Mammals	
Northern Long-eared Bat	
Silver-haired Bat	
Eastern Red Bat	
Hoary Bat	


In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-167 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both white pine – red maple swamp and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:


- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of white pine – red maple swamp in each of the Ecological Landscapes (Tables 3-168 and 3-169).
- Using the analysis described above, a species was further selected if it had both a significant association with white pine – red maple swamp and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of white pine – red maple swamp. These species are shown in Figure 3-40.


Table 3-168. Vertebrate Species of Greatest Conservation Need that are (or historically were) significantly associated with white pine – red maple swamp communities and their association with Ecological Landscapes that support white pine – red maple swamp.

White Pine - Red Maple Swamp		Birds (1)*
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Very	
MAJOR		
Central Sand Plains		

Color Key

 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape

 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-169. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with white pine – red maple swamp communities and their association with Ecological Landscapes that support white pine – red maple swamp.

White Pine - Red Maple Swamp		Birds (3)*			Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type		Northern Goshawk	Red-shouldered Hawk	Canada Warbler	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
	MAJOR							
	Central Sand Plains							

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Color Key

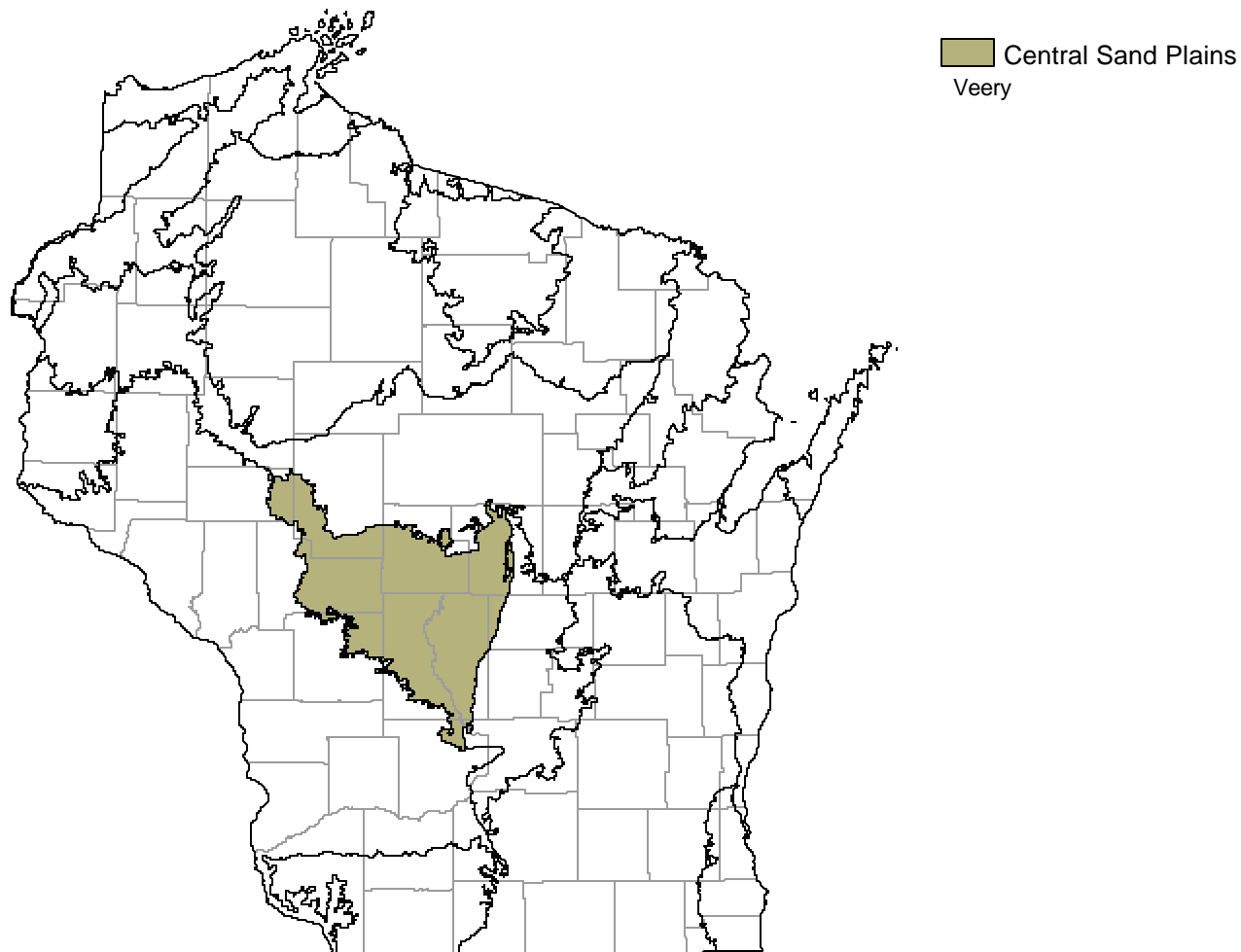
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-40. Vertebrate Species of Greatest Conservation Need that have both a significant association with white pine – red maple swamp and a high probability of occurring in an Ecological Landscape (s) that represents a major opportunity for protection, restoration and/or management of white pine – red maple swamp.



3.3.7.10.3 Threats and Priority Conservation Actions for White Pine – Red Maple Swamp

3.3.7.10.3.1 Statewide Overview of Threats and Priority Conservation Actions for White Pine – Red Maple Swamp

The following list of threats and priority conservation actions were identified for white pine – red maple swamp in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.7.10.3.2 unless otherwise indicated.

Threats and Issues

- Unsustainable forest management practices and harvest during improper seasons or conditions can result in soil compaction, rutting, channeling of water, and sedimentation into streams and wetlands. Depending on site-specific conditions, the creation of water channels and ruts can dry a site, or, alternatively, can raise the water table and alter vegetative composition.
- Invasives such as glossy buckthorn are already a problem in some places, and garlic mustard was documented in this type for the first time in late 2004.
- Motorized recreation and high road densities contribute to soil loss and sedimentation, and facilitate the spread of invasive plants.
- High deer populations can lead to excessive browse pressure on young white pine and palatable herbaceous species.
- Older stands are currently being identified for harvest, which often results in the loss of uncommon structural features such as large trees and high canopy closure.
- For purposes of forest management, this community is generally classified together with upland sites as “white pine”. More specific prescriptions need to be developed, that will afford better protection to the fragile substrate and important microsites that are not present in dry “white pine” forests.
- Windthrow gaps, and the pit and mound microtopography associated with this natural disturbance, are common and ecologically important structural features that are reduced in abundance in more intensively managed stands of younger forest. In general, this loss of structural complexity contributes to stand simplification. Conversely, clearcuts that are placed adjacent to this type can render them vulnerable to excessive levels of windthrow.
- Habitat fragmentation can be an issue in some parts of the range of this type, in part due to the scale and configuration of timber harvest units.
- This community is uncommon, highly localized, and vulnerable to hydrologic and other disruptions. Intact stands in or approaching old growth conditions are rare and continue to decline, despite their exceptionally high biodiversity values.

Priority Conservation Actions

- Manage this type within large forest blocks to maximize ecological benefits where possible, and reduce stand vulnerability to excessive levels of windthrow.
- Increase connectivity, promote the development of older stands with high canopy closure, and protect site hydrology.
- Monitor and control invasive plants and discourage management practices and recreational uses that facilitate their spread. Continue to support research designed to identify effective biological controls.
- Use Best Management Practices and other sustainable forest community management practices to prevent detrimental soil and water effects.
- Promote awareness of the high ecological values of older, intact stands and work with managers to ensure that these are better represented on the landscape in the future.
- Use adaptive management techniques to restore structure and composition; monitor and share results.

3.3.7.10.3.2 Additional Considerations for White Pine–Red Maple Swamp by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of white pine–red maple swamp exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for white pine–red maple swamp in Section 3.3.7.10.3.1.

Additional Considerations for White Pine–Red Maple Swamp in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of White Pine–Red Maple Swamp

Central Sand Plains

A majority of the older, intact occurrences of this type have been documented in the Central Sand Plains, making this Ecological Landscape the best place to maintain and potentially increase this type. Examples include Jay Creek Pines State Natural Area, Robinson Creek Pines State Natural Area, and Ketchum Creek Headwaters State Natural Area, all in eastern Jackson County.

Additional Considerations for White Pine–Red Maple Swamp in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of White Pine–Red Maple Swamp

Western Coulees and Ridges

A few examples have been documented in the east central part of the Ecological Landscape, in the immediate vicinity of Fort McCoy Military Reservation (Monroe County).